



LOS ANGELES COUNTY
SOLID WASTE MANAGEMENT COMMITTEE/
INTEGRATED WASTE MANAGEMENT TASK FORCE
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DEAN D. EFSTATHIOU
CHAIRMAN

March 19, 2008

Ms. Mary Nichols, Chair
California Air Resources Board
P.O. Box 2815
Sacramento, CA 95812

Dear Chairperson Nichols:

FEBRUARY 28, 2008 BOARD MEETING AGENDA ITEM 08-2-6: REPORT OF THE ECONOMIC AND TECHNOLOGY ADVANCEMENT ADVISORY COMMITTEE

On behalf of the Los Angeles County Integrated Waste Management Task Force (Task Force), I want to thank the California Air Resource Board (CARB) for the opportunity to comment on the report entitled *Technologies and Policies to Consider for Reducing Greenhouse Gas Emissions in California*, which was prepared by the Economic and Technology Advancement Advisory Committee (ETAAC) and released to the public by your Board on February 18, 2008. As your Board reviews the 55 report recommendations proposed by ETAAC to eliminate greenhouse gas (GHG) emissions, we would also urge you to consider both the environmental and economic life-cycle analysis of all recommendations. Following a more detailed review of the report, this letter is a follow-up to the comments provided by Mike Mohajer of the Task Force, sent to your Board electronically on February 24, 2008 (copy enclosed).

Pursuant to Chapter 3.67 of the Los Angeles County Code and the California Integrated Waste Management Act of 1989 (AB 939, as amended), the Task Force is responsible for coordinating the development of all major solid waste planning documents prepared for the County of Los Angeles and the 88 cities in Los Angeles County with a combined population in excess of ten million. Consistent with these responsibilities, and to ensure a coordinated and cost-effective and environmentally-sound solid waste management system in Los Angeles County, the Task Force also addresses issues impacting the system on a countywide basis. The Task Force membership includes representatives of the League of California Cities-Los Angeles County Division, the Los Angeles County

Board of Supervisors, the City of Los Angeles, the waste management industry, environmental groups, the public, and a number of other governmental agencies.

On behalf of the Task Force, we respectfully request your consideration of the following comments to provide additional context and details to the report's recommendations, which the report acknowledges were not fully developed in some cases:

- The Task Force strongly supports recycling as an important element of our integrated solid waste management system and recognizes its value in reducing our dependence on current disposal options. However, without having a complete economic and environmental life-cycle analysis, it is not possible to measure the net impact in GHG emissions that result from recycling activities. Additionally, the California recycling industry is very complex and extends beyond California and U.S. boundaries to foreign countries. However, environmental laws and regulations in some of these countries are non-existent or weak when compared to California. It should also be recognized that there are no jurisdictional boundaries that would limit the movement of air contaminants (including GHG emissions) from these countries to California, which can negatively impact our air quality and our residents' wellbeing. Thus, it is critical for the State to take the lead in conducting a complete life-cycle analysis for all recycling activities, as well as taking a strong role in the promotion of local markets for recyclables.
- The Task Force has a long track record of supporting initiatives that promote extended producer responsibility because of its significant potential to reduce commercial/manufacturing waste, energy consumption, and GHG emissions. Although we appreciate the report's acknowledgement of this issue, we support a significantly expanded analysis of potential GHG emission reductions associated with extended producer responsibility. Such an analysis would help inform decision makers contemplating implementation of extended producer responsibility programs, which have the potential to impact all aspects of our integrated solid waste management system.
- Without any scientific analysis or justification, the report claims that composting would avoid the generation and emission of methane gas as compared to other disposal options. Although the Task Force is in support of composting, the development of composting facilities in metropolitan/urbanized areas is unlikely to be a valid solid waste management option unless composting activities are conducted in enclosed facilities that operate under negative pressure to control odors and ensure proper air quality in protecting the health

and safety of neighboring residents. Additionally, a complete economic and environmental life-cycle analysis for composting should be conducted to verify the validity of the report's recommendations.

- Listed in the report (Chapter 4, Section L) is a menu of potential options that the California Integrated Waste Management Board (CIWMB) and CARB could choose to promote the expansion of composting. One option is a per-ton GHG emission surcharge on landfill operators. The Task Force would be open to the implementation of such fees provided these fees are imposed on all elements of the integrated waste management system, and a clear and binding criteria is stated as to how these monies will be used.
- The Task Force disagrees with the report's claim that greenwaste is not an effective material for use as landfill alternative daily cover (ADC). Prior to its approval by the appropriate regulatory agencies, a series of field testing and demonstration activities were conducted to substantiate that greenwaste when used as ADC meets all performance and health and safety criteria established by the CIWMB; as such, the report's claim is unfounded. The Task Force strongly opposes the report's recommendation to phase out diversion credit for the use of greenwaste as a landfill ADC, since it would divert green materials from composting activities. Again, this claim is unfounded and is contrary to the report's finding (Chapter 4, Pg 4-17) which states that currently over 12 million tons of compostable organics are being disposed in landfills annually and would be available for composting. In addition, the recently completed lifecycle analysis by the County Sanitation Districts of Los Angeles County (copy enclosed) has shown that the use of greenwaste as ADC has **three times** the GHG emissions reduction potential when compared to composting. At present, the CIWMB is conducting a broader life cycle assessment of organic material management options due to be completed next year, which should serve to guide policies on organic materials management developed at the State level.
- The Task Force is very pleased with findings in Chapters 4, 5 and 6, and Appendix IV of the report which highlight existing barriers that have significantly hindered development of conversion technologies in California. The report recognizes that these barriers include but are not limited to legislative and regulatory barriers, and that this issue needs to be addressed. The Task Force has been a strong supporter of conversion technologies and has played a major role in promoting their development. As a result of the County of Los Angeles' leadership in evaluating and promoting the development of these advanced alternatives to landfill disposal, AB 2770 was adopted in 2002. AB 2770 among other things required the Waste Board to conduct a study and life-cycle analysis

of conversion technologies. This three-year, \$1.5 million study to verify the viability of these technologies as an element of our integrated solid waste management system was conducted in concert with the Universities of California at Davis and Riverside. The findings of this report substantiated not only the viability of conversion technologies as an alternative to landfilling, but their ability to produce clean renewable energy that can significantly reduce GHG emissions and our dependence on fossil fuels. Unfortunately, the ETAAC's report failed to make any reference to the findings of the subject study.

Since 2003, the Task Force has further expanded its activities with the County of Los Angeles for the development of a demonstration facility in Southern California. As a part of this effort, members and staff of the Task Force's Alternative Technology Advisory Subcommittee visited a number of existing conversion technology facilities in Europe and Japan to insure the viability of these facilities for California. As confirmed by the AB 2770 study and our site visits and investigation, there hundreds of conversion technology facilities currently operating in Europe and Japan using municipal solid waste as a feedstock.

While our findings further substantiate the viability of these facilities, we continue to maintain our position that the State must take the lead in promoting the development of these clean technologies. At the least, the State should move swiftly to remove the existing legislative and regulatory barriers to the development of these technologies in California.

As such, we were dismayed by the report's recommendation (Chapter 6, pp 6-8 & 6-20) that conversion technology facilities using post-recycled solid waste residuals should be treated significantly differently as compared to those facilities that use "agricultural waste" as feedstock, and are opposed to this proposal. We call on the CARB to develop and promulgate criteria based on performance and compliance with required rules and regulations, rather than developing prescriptive policies that pick a technology/feedstock winner.

The Honorable Mary Nichols
March 19, 2008
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The Task Force looks forward to the opportunity to work with the CARB and other appropriate agencies to ensure an environmentally and economically viable integrated waste management system that is protective of our citizens' health and safety as well as our natural resources. If you have any questions, please contact Mr. Mike Mohajer of the Task Force at (909) 592-1147.

Sincerely,



Margaret Clark, Vice-Chair
Los Angeles County Solid Waste Management Committee/
Integrated Waste Management Task Force and
Council Member, City of Rosemead

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Enc.

cc: The Honorable Governor Schwarzenegger
Each Member of the Los Angeles County Legislative Delegation
Each Member of the California Air Resources Board
Each Member of the CARB Economic and Technology Advancement Advisory Committee
Each Member of the California Integrated Waste Management Board
California State Association of Counties
The League of California Cities, Los Angeles County Division
Each Member of the County of Los Angeles' Board of Supervisors
Each City Mayor in Los Angeles County
South Bay Cities Council of Governments
San Gabriel Valley Council of Governments
Gateway Cities Council of Governments
Southern California Association of Governments
Each Member of the Los Angeles County Integrated Waste Management Task Force
Each Member of the Los Angeles County Alternative Technology Advisory Subcommittee

From: Mike Mohajer [mikemohajer@yahoo.com]
Sent: Sunday, February 24, 2008 4:10 PM
To: Mary Nichols; CARB Board Members
Cc: James Goldstene; Steve Church; Margo Reid Brown; Wesley Chesbro; Jeffrey Danzinger; Rosalie Mule; Cheryl Peace; Gary Petersen
Subject: 2/28/08 CARB Meeting, Item # 08-2-6 ---- Report of the Economic and Technology Advancement Advisory Advancement Committee

Madam Chair and Members of the Board,

On behalf of the Los Angeles County Integrated waste Management Task Force (Task Force), I want to thank you the California Air Resource Board (CARB) for the opportunity to comment on the February 11, 2008 final report entitled *Technologies and Policies to Consider for Reducing Greenhouse Gas Emissions in California*, which was prepared by the CARB's Economic and Technology Advancement Advisory Committee (ETAAC) and released to the public by your Board on February 18, 2008. I also want to commend the ETAAC's Members for their considerable efforts in preparation of the subject report and its recommendations on such a short time frame established by the California Global Warming Solution Act of 2006 (AB 32). Such a short time frame may be the cause for a number of recommendations by the ETAAC in regards to our state integrated solid waste management (ISWM) system which have been formulated without any scientific basis and/or a balance objective to ensure a net reduction in greenhouse gas (GHG) emissions. The following provides a brief list of our initial concerns which are being provided on an interim basis due to the short time frame since this matter is set for your Board consideration on February 28, 2008.

Pursuant to Chapter 3.67 of the Los Angeles County Code and the California Integrated Waste Management Act of 1989 (AB 939), the Task Force is responsible for coordinating the development of all major solid waste planning documents prepared for the County of Los Angeles and its 88 cities in Los Angeles County with a combined population in excess of 10 million. Consistent with these responsibilities, and to ensure a coordinated and cost-effective and environmentally-sound solid waste management system in Los Angeles County, the Task Force also addresses issues impacting the system on a Countywide basis. The Task Force membership includes representatives of the League of California Cities-Los Angeles County Division, the County of Los Angeles Board of Supervisors, the City of Los Angeles, the waste management industry, environmental groups, the public, and a number of other governmental agencies.

I. The Task Force strongly supports recycling as an important element of our ISWM system and recognizes its value in reducing our dependence on disposal options. However, without having a full and complete economic and environmental life-cycle analysis for this technology, it is scientifically not possible to measure reductions or increases in GHG emissions resulting from recycling activities. Additionally, the California recycling industry is very complex and extends beyond the California and the U.S. boundaries to foreign countries. A number of Pacific Rim countries play a major role in providing a market for our recyclable materials. However, environmental laws and regulations in some of these countries are non-existent as compared to California. It should also be recognized that there are no jurisdictional boundaries that would limit the movement of air contaminants (including GHG) from these countries to California negatively impacting our air quality and well being of our residents. This is a critical concern which further substantiate the need for the state to take the lead in conducting a complete life-cycle analysis for our recycling option as it has been recommended by the Task Force for many years.

Based on the foregoing and without any consideration by the ETAAC for the economic impacts on local governments, the Task Force respectfully disagrees with the report recommendations for increases in the recycling rate by an additional 25 percent by 2012 as currently proposed by Senate Bill 1020 (Padilla).

II. The Task Force has a long track record of supporting initiatives that promote producer responsibility

because of its major role in reducing commercial/manufacturing waste as well as its positive impact on the reduction of energy consumption and potential reduction in GHG emission. As such, we appreciate the report's acknowledgement of the subject but at the same time disappointed by the lack of any analysis by the ETAAC. Producer responsibility impacts all aspects of our ISWM system, and therefore, it warrants much more consideration.

III. Without conducting any analysis or estimation of GHG emissions, the report incorrectly claims that composting would avoid the generation and emission of methane gas as compared to other disposal options. While the Task Force is in support of composting, we do not believe the development of composting facilities in metropolitan/urbanized areas is a valid ISWM option unless composting activities are conducted in enclosed facilities that operate under negative pressure to control odors and ensure air quality in protecting health and safety of neighboring residents. Additionally, a complete economic and environmental life-cycle analysis on the composting option needs to be conducted to verify the validity of the recommendations.

For many years, the Task Force has been an advocate for the state to take a proactive role in developing markets for composted products. We are pleased that the ETAAC has arrived at the same conclusion.

IV. The Task Force disagrees with the report's claim that greenwaste is not an effective material for use as a landfill alternative daily cover (ADC). Prior to its approval by the appropriate regulatory agencies, a series of field testing and demonstration activities were conducted to substantiate that greenwaste when used as ADC meets all performance and health and safety criteria established by the California Integrated Waste Management Board. As such, the report's claim is unfounded.

The Task Force also strongly opposes the report's recommendation to phase out the diversion credit for use of greenwaste as a landfill ADC on the basis that such a use would divert green materials from composting activities. Again, such a claim is unfounded and it is contrary to the report's finding (Chapter 4, Pg 4-17) that currently over 12 million tons of compostable organics are being disposed in landfills on an annual basis and would be available for the composting option.

V. The Task Force is very pleased with the ETAAC findings as discussed in Chapters 4, 5 and 6, and Appendix IV of the report that the existing barriers, including but not limited to legislative and regulatory, have significantly hindered the development of conversion technologies in California and that they need to be addressed.

The Task Force has been a strong supporter of conversion technologies and played a major role which resulted in the enactment of AB 2770 in 2002. AB 2770 specifically required the California Integrated Waste Management Board to conduct a study, including life-cycle analysis, to verify the viability of these technologies as an element of our ISWM system and provided a funding in the amount of \$1.5 million for the required study. The result of the 3-year study which was conducted in concert with campuses of the University of California at Davis and Riverside substantiated the viability of these technologies as an ISWM option while producing renewable energy to reduce our dependence on fossil fuel and reducing GHG emission. Unfortunately, the ETAAC's report failed to make any reference to the findings of the subject study .

Since 2003, the Task Force has further expanded its activities with the County of Los Angeles for the development of a pilot demonstration facility in Southern California. As a part of this effort, the Task Force has also visited a number of existing conversion technology facilities in Europe and Japan to insure the viability of these facilities for California. While our findings further substantiate the viability of these facilities, we continue to maintain our position that the state must take the leadership as well as a proactive and visible role in removing the existing legislative and regulatory barriers to the development of these technologies in California.

Based on the results of the AB 2770 study and our site visits and investigation, there are over 200 conversion technology facilities currently operating in Europe and Japan using municipal solid waste as their feedstock. As such, we were dismayed by the report's recommendation (Chapter 6, pp 6-8 & 6-20) that conversion technology facilities using post-recycled solid waste residuals need to be significantly treated differently as compared to those facilities that use "agricultural waste" as feedstock. Needless to say, we are opposed to

the said proposal. The criteria should be based on performance and compliance with required rules and regulations and not on a "government policy" to pick a technology/feedstock winner.

The Task Force is looking forward to the opportunity to work with the CARB and other appropriate agencies to ensure an environmentally and economically viable ISWM system that is protective of our citizens' health and safety as well as our natural resources.

Thank you again for the opportunity to submit these initial comments. Should you have any question, please contact me at 909-592-1147.

Regards,

MIKE MOHAJER, Member
LA County Integrated Waste Management Task Force
mikemohajer@yahoo.com
P.O.Box 3334, San Dimas, CA 91773-7334

cc: Each Member of the California Integrated Waste Management Board
Each Member of the Los Angeles County Integrated Waste Management Task Force



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STEPHEN R. MAGUIN
Chief Engineer and General Manager

March 5, 2008

Chairman Mary D. Nichols
California Air Resources Board
1001 I Street
Sacramento, CA 95814

Dear Chairman Nichols:

Comparison of the Use of Green Waste as Alternative Daily Cover (ADC) vs. Composting: Greenhouse Gas Emission (GHG) Impacts

The Sanitation Districts of Los Angeles County have recently completed a life cycle analysis wherein the GHG emissions were compared for green waste ADC and composting. Since the passage of Assembly Bill 32, regulatory agencies and stakeholders alike have been engaged in an assessment of waste management practices relative to climate control, including a great amount of discussion regarding waste management approaches for organic waste. While we recognize statutory context of the waste management "hierarchy" and anticipate the upcoming debate on green waste ADC diversion credit, at this time, we are bringing these important technical study results to you to aid in your ongoing consideration of these issues. I am attaching the study results. To summarize:

- The Sanitation Districts have conducted a full life cycle analysis of the greenhouse gas emissions from ADC and composting, using three different models, including US EPA's WARM model.
- The results of the life cycle analysis confirm that composting of green waste results in a net reduction of carbon emissions, but using green waste as an ADC reduces carbon emissions, and thus greenhouse gases, **3 times more** than composting.
- Realistic assumptions for technical factors were used in the above-referenced analysis, but even if carbon sequestration was factored out of the analysis, the results indicate that ADC still provides a greater greenhouse gas reduction than composting.
- In conducting the life cycle analysis, a key consideration in evaluating ADC usage is landfill gas collection efficiency. The conclusions regarding a carbon benefit of ADC hold true even using the regulatory default of collection efficiency, 75%, and down to the unrealistic value of 33%.

In conclusion, while we are fully supportive of composting and do, in fact, have one of the largest composting programs in the state, from a climate control perspective, managing green waste as ADC provides a significant reduction in GHG emissions, even when compared to composting. We welcome

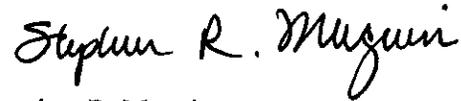
Chairman Mary D. Nichols

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March 5, 2008

discussion with you and your staff regarding the results of the study. If you have any questions regarding this letter, please do not hesitate to contact Frank Caponi, Supervising Engineer of the Air Quality Section at (562) 908-4288, extension 2460.

Very truly yours,

A handwritten signature in black ink that reads "Stephen R. Maguin". The signature is written in a cursive, flowing style.

Stephen R. Maguin

SRM:GRC:dsh
977911

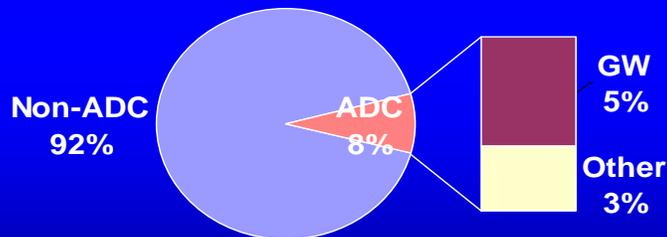
cc: Board Members
J. Goldstene, Executive Officer



Evaluation of Green Waste (GW) Management Impacts on GHG Emissions: Alternative Daily Cover (ADC) Compared with Composting

- The use of green waste (GW) as alternative daily cover (ADC) is often portrayed as contributing to greenhouse gas emissions, and the composting of GW is often assumed to be an environmentally superior alternative because it reduces GHG emissions.
- This analysis verifies the benefits of composting but also shows that GW ADC is actually three times more beneficial in reducing GHG emissions when compared to the composting of GW.
- The conclusions are based on a life cycle analysis that included transportation and equipment handling emissions, as well as fossil fuel emissions avoided from a range of landfill gas management approaches.

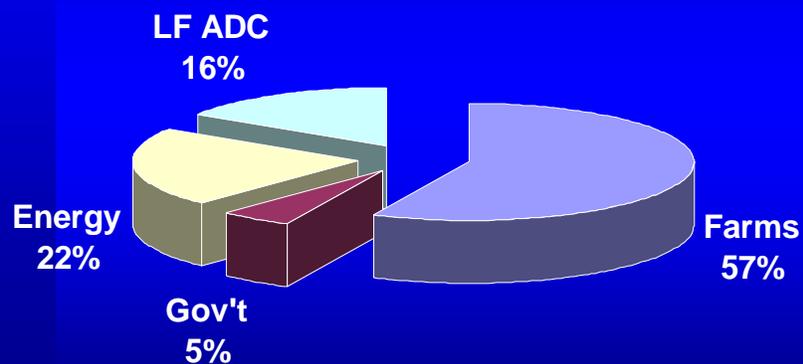
Diversion of Municipal Solid Waste in California



- Just over half of all California-generated municipal solid waste is diverted by various means.
- Landfill ADC is a small, but important, contributor to diversion.
- GW is the major ADC component but others include auto shredder fluff and wastewater biosolids.

Sources: Derived from year 2006 data at <http://www.ciwmb.ca.gov/LGCentral/DRS/Reports/Statewide/SWTotals.asp> and <http://www.ciwmb.ca.gov/LGCentral/Rates/Graphs/RateTable.htm>

Organics Diversion in California

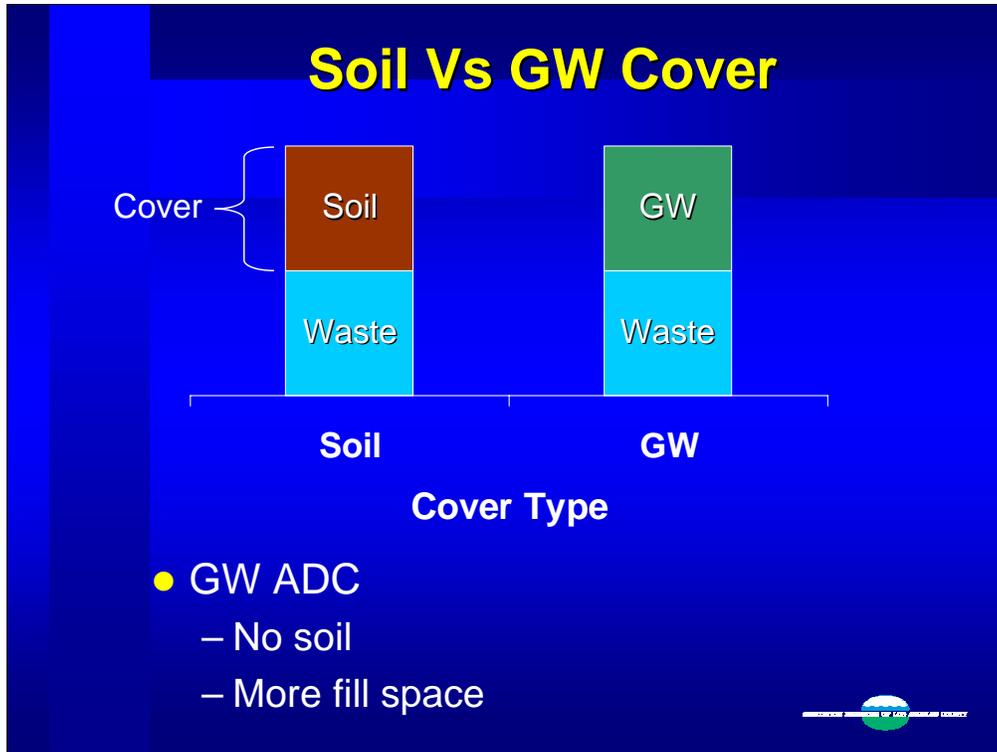


Source : CIWMB (2000)
(Includes GW compost and mulch)



- A significant amount of organics is currently diverted in the state; ADC represents a relatively small portion of this diversion.
- Composting is a significant portion of the “Farms” category.

Source: <http://www.ciwmb.ca.gov/organics/Measure/Marketplace.htm> (accessed 2007, 2008)



- This slide demonstrates an important benefit of ADC.
- Prior to the use of GW ADC, larger amounts of cover soil had to be imported, consuming fossil fuels.
- GW ADC consumes much less fossil fuel than soil when used as a cover material.
- It also saves valuable landfill space because it displaces cover soil and it more efficiently compacts under the weight of the next lift of MSW.
- Although other ADC's are commercially available, their use is not always appropriate on a site-specific technical basis.

Green Waste Used as ADC



Green waste grinding.

Green waste placed
as ADC.



- Green waste is ground before use as ADC or off-site shipment to other users (e.g., composters).
- A landfill “scraper” scoops up the shredded GW then distributes it across the compacted municipal solid waste.

Comparison of GHG Reductions for ADC and Composting



- This presentation compares GHG Emissions for ADC and composting.
- This comparison was made using a comprehensive GHG lifecycle analysis.

Typical GHG Lifecycle Analysis

- Categories
 - Virgin inputs & energy usage
 - Stages (*e.g., transportation and materials handling*)
 - Emissions (*anthropogenic only*)
 - Reductions
 - Carbon sequestration
 - Emission offsets



•The lifecycle analysis has four categories: input of virgin materials and energy, stages of activity such as transport and processing, emissions from the approach itself, and any emission reductions due to offsets (e.g., displacing fossil fuel use).

•An important concept in GHG lifecycle analyses is that carbon originating from natural sources may produce either biogenic or anthropogenic emissions. Carbon dioxide emissions are considered biogenic as these are part of the natural carbon cycle and so are excluded from the analysis. Methane emissions are considered anthropogenic as these are not commonly produced in the natural carbon cycle and so are included in the analysis.

•Methane is singled out because it has a greater global warming potential than carbon dioxide. A global warming potential of 23 by weight was used for methane in this analysis (i.e., 1 unit weight of methane has the same global warming potential as 23 times greater weight of carbon dioxide).

•Some forms of carbon may persist under various conditions in a stable form and so are removed from the natural carbon cycle. Such carbon is considered “sequestered”. Examples of such carbon include soil lignin and peat.

Lifecycle Tools

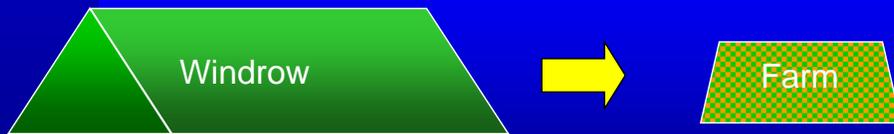
- EPA WARM
 - Flexible tool for variety of MSW scenarios
- LACSD Model
 - Dedicated spreadsheet
 - GW Compost & ADC
 - Similar to EPA WARM
 - But uses latest factors
- Canadian EPIC
 - Literature results reported here



- Three different models were used in this analysis.
- The EPA WARM tool is a general purpose model useful for analyzing a variety of MSW management scenarios.
- The Los Angeles County Sanitation Districts (LACSD) model is a spreadsheet dedicated to analyzing GW composting and ADC applications.
- Literature results for the Canadian EPIC model for yard trimmings composting and landfilling are also included in this study as these are similar to the GW scenarios.

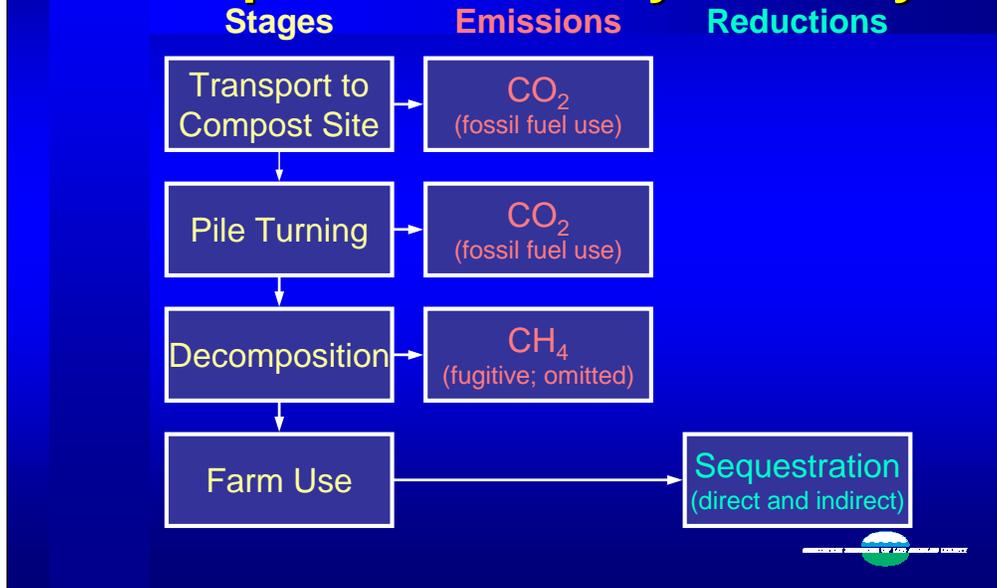
Composting Scenario

Composting of Shredded GW
(windrowed);
Product used in agriculture



- The GW compost scenario evaluates composting of shredded green waste with the end product used in a farming applications.

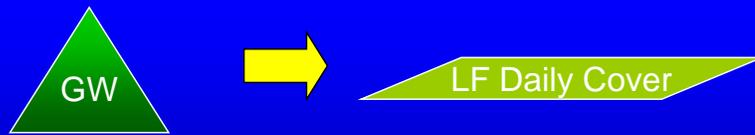
Compost GHG Lifecycle Analysis



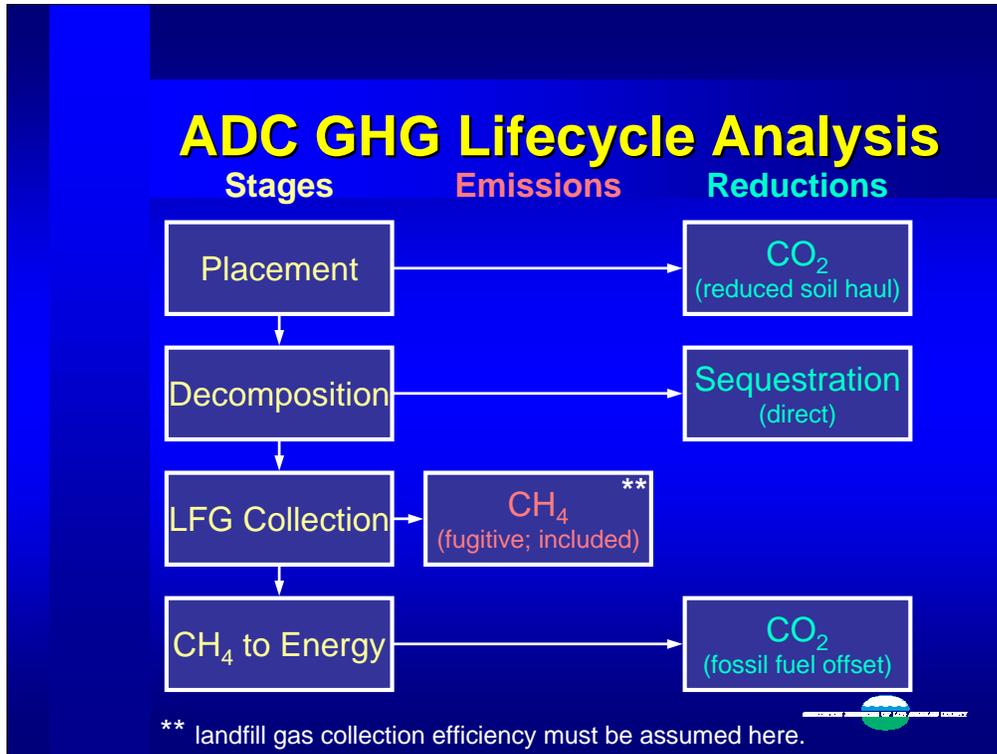
- Fossil Fuel emissions from the shredding operation are excluded because both composting and ADC use involve shredding.
- TRANSPORT: Long distance GW transport to a compost facility consumes fossil fuels and generates GHG CO₂ emissions.
- PILE TURNING: Compost pile turning consumes additional fossil fuel and generates GHG CO₂ emissions.
- DECOMPOSITION: Composting can produce fugitive methane emissions at a rate similar to an efficiently operated landfill gas control system. These emissions are NOT included in the analysis as the data are limited.
- FARM USE: Use of compost in farming produces a small amount of direct and a larger amount of indirect carbon sequestration. Carbon normally accumulates (“sequesters”) in soils due to the presence of non-degradable organics (e.g., “lignins”). In this manner, when applied to land, compost directly produces a small amount of sequestered carbon. More importantly, composting indirectly sequesters carbon by fostering improved growth of farmed products.
- Both direct and indirect sequestration was considered in this study.

ADC Scenario

Shredded GW spread as ADC



- The GW ADC lifecycle scenario addresses its placement as a daily cover and subsequent contribution to landfill gases.



- PLACEMENT:** GW ADC placement as a daily cover reduces fossil fuel use when compared with soil as cover and so reduces carbon dioxide emissions.

- DECOMPOSITION:** GW directly sequesters large amount of carbon during the decomposition process. Carbon sequestration (in other words, carbon storage) of the GW in a landfill is quantitatively larger than for composting because the conditions within a landfill are not favorable for the decomposition of many types of GW. Noted “garbologist” Dr. William Rathje has long noted the resistance of landfill organics to decomposition. However, this study used conservative assumptions that minimize the calculated sequestration.

- LFG COLLECTION:** Virtually all GW ADC in California is used at landfills that are equipped with landfill gas collection systems. Recent research has shown that these systems are highly effective, collecting nearly all gases. However, a wide range of conservative collection efficiency estimates representative of California landfills were made for this analysis. The importance of this assumption will be discussed later in this presentation.

- CH₄ TO ENERGY:** Many landfills generate energy with the collected methane. This offsets the need for fossil fuels.

Special GW ADC Considerations

- LF volume conservation (not considered in this study)
- Provides odor control
- No evidence that GW ADC allows greater fugitive emissions of methane when compared to soil



- Although not considered as an assumption in the lifecycle analysis, GW ADC usage can conserve landfill volume.
- It should also be noted that other ADC's may not control odors as well as GW or be otherwise restricted based on site-specific conditions.
- In general, freshly placed waste does not generate methane and studies of GW ADC have not indicated any greater surface emissions when compared to soil. At the Sanitation Districts landfills, the South Coast Air Quality Management District requires routine monitoring of all landfill surfaces, including GW ADC, using the most stringent standards in the nation. This monitoring has not detected surface emissions due to the use of GW ADC.

LIFECYCLE ANALYSIS: GHG Budget

Net Reductions =

+ reductions

- emissions



- The results of a GHG lifecycle analysis can be expressed as a simple budget, the difference between reduction and emissions.

Summary

Net GHG Reductions (%C relative to initial weight)

<u>Model</u>	<u>Location</u>	<u>ADC</u>	<u>Composting</u>
LACSD	California	16.8	4.9
EPIC	Canada	12.0	0.0
USEPA WARM	US	22.0	5.0

- ***GW ADC reduces carbon 3+ times more than composting***



- With the use of all available lifecycle models, ADC is shown to reduce GHG emissions more than GW composting.
- The LACSD model indicates a more than three fold reduction in GHG emissions for ADC as compared to composting.
- The USEPA WARM model indicates a more than four fold reduction in GHG emissions for ADC however it uses less current factors as compared to the LACSD model.
- The Canadian study using the EPIC model indicates similar GHG reductions for yard trimmings.

GHG Emissions are Reduced for a Wide Range of Landfill Gas Collection Efficiencies

- Actual versus modeled efficiencies

Actual	Model
85 – 100%	75 – 95%

– Minimum for GW ADC benefit: 33%



• Modeled LFG collection efficiencies were conservative relative to that actually measured at California LF's (75-95% modeled vs 85 to 100% measured; see Huitric et al (2007)).

• The modeling shows that there continues to be a GHG reduction using GW as ADC until gas collection efficiency drops to 33%, far below EPA's very conservative default 75% collection efficiency.

Reference: Huitric, R., Kong, D., Scales, L., Maguin, S., and Sullivan, P. (2007), "Field comparison of landfill gas collection efficiency measurements", Solid Waste Association of North America (SWANA) 30th Annual Landfill Gas Symposium, Monterey, CA.

Role of Landfill Carbon Sequestration

- With sequestration
 - ADC provides much more GHG reductions than composting
- Without sequestration
 - ADC still provides more GHG reductions than composting



•The modeling showed that although LF carbon sequestration is important, even in the absence of any sequestration, LF ADC still provides significant GHG reductions, more so than composting.

Findings

- Consistent with previous studies (e.g., USEPA, 1998; Canadian EPIC, 2002), this study showed that GW ADC generates 3 times more GHG reductions than composting.
- Composting is an important waste diversion strategy to complement rather than replace ADC use.



•It shows that ADC generates 3 times plus the GHG reductions attributed to compost.

•Nonetheless, composting is an important waste diversion strategy that complements, rather than replaces, ADC use.