The Role of Organics Management in a Sustainable Community
October 2009 by Jim McNelly

A Primer for Public Officials

After instituting recycling programs, bike lanes and banning yard trimmings from landfills during the 1990s decade of the environment, interest in the 21st century "Carbon Footprint" has public officials increasingly looking for new ways to become even more "eco friendly". Conflicting environmental claims have left many officials wary that product marketing may be little more than "greenwash" gimmickry. Many are asking, "Where is the comprehensive vision for community leaders to embrace that will enable them to lead their community into the Sustainable 21st Century?"

The vision is actually quite simple, and the vision is "organics management".

Organics Management strategies deals with organic materials sent to the landfill, composting facilities, or land applied. Organics Management programs involve virtually every level of local and state government. New generations of bio-processing technologies go beyond simple composting programs in ways, which when properly implemented, can clean ground and surface waters, reduce smog, support local food production, enhance parks, beautify roads, reduce greenhouse gasses, promote renewable energy, reduce wastewater treatment expenditures, lower solid waste processing costs, stimulate bio-based industries and generally enhance the quality of life in a new generation of "low carbon footprint" community planning activities.

People Want to Protect the Environment

Some polls report that as many as 87% of Americans consider themselves to be "environmentalists". It is a political fact that voters care about the environment and can be motivated to put their votes and tax dollars toward officials and programs that are perceived "save the earth" or "help the environment". In the 1960s and 70's, the repulsion experienced regarding polluted rivers and lakes from the sight of dead fish and closed beaches gave rise to the various clean water acts and the wholesale upgrading of our nation's wastewater treatment infrastructure. Smog and air pollution anxieties have lead to increasingly stronger versions of the Clean Air Act. When people see a direct cause and effect relationship between paying for environmental improvements and benefits, they will pay for the environmental value. People do not complain about the cost of pollution control systems in their autos, nor do they object to their monthly sewer bills. They see that these costs improve their quality of life. The primary role of the public official promoting new green technologies to be able to communicate to stakeholders how these new industries are meeting the new quality of life standards.

Recycling is as American as Apple Pie

The 1980s brought about changes in solid waste management practices. Citizens could make a connection with contaminated groundwater and poorly designed landfills. They also know intuitively that there are finite resources on the planet and that recycling is a way that they can do their part to "be a part of the solution, not the problem". It seemed to be common knowledge that we "were running out of landfill space", even though there was actually plenty of landfill space, albeit in far fewer landfills. Recycling activities proliferated throughout the country and once again, citizens have largely not complained about the cost of a few extra dollars per month to pay for the recycling program. Education has reached the schools to the point that children and the younger generation are the biggest recyclers. Hardly a politician would dare threaten a local recycling program, which has become as American as motherhood, baseball, and apple pie.

Composting Comes of Age

Beginning with only a handful of composting facilities in the 1970s, there are now over three thousand municipal composting operations. Nearly all states have some sort of a program that requires leaves, grass clippings, and brush to be diverted from landfills. These sites have become very popular with citizens, with more and more people using compost to enrich their gardens, lawns and landscaping. Yard organics represented nearly 20% of the solid waste stream and are some of the easiest materials to divert from landfills. Most of Canada, the European Union and the City of San Francisco have gone so far as to totally ban ALL organics from their landfills, creating opportunities to compost food waste, paper and other organic materials in addition to wood and yard trimmings.

Resource Recovery Feels Good

Costs of landfilling garbage have risen exponentially, but again, with some grumbling here and there, people are willing to pay for the extra value of proper disposal in order to protect the environment. Voters tend to think in terms of "costs per month" whereas politicians and resource recovery staff think more in terms of "costs per ton". If the cost per ton for resource recovery may be higher than landfilling, most people don't mind if it makes them "feel better". For most people, recycling and landfill abatement is a form of "guilt alleviation".

The Details Get Fuzzy

In the 1990s, the environmental solutions were not as clear or obvious to the citizen as they were in the previous decades. For example, most people do not know the difference between ozone depletion and global warming. Chlorinated fluorocarbons (CFCs) is connected to ozone depletion whereas carbon dioxide is associated with global warming. These "causes and effects" can be difficult for citizens to fully understand. People are perplexed when paying a premium for CFC- free refrigeration, but are not quite willing yet to pay for CO2 reduction. Hot summers are bad, warm winters are good. Even if climate change is man made, does that make it automatically "bad"? What's the problem again with global warming? The same state of confusion is commonly seen regarding landfills, especially when they see on TV that a large waste company is making electricity and creating parkland from landfill sites. How bad can that be?

Landfills May Not Be All Bad

There is an often repeated environmental argument that we should recycle because it "takes hundreds of years" for plastic (or whatever) to decompose. This assumes an active landfill

where everything “should” degrade into topsoil that can be used to fill lowlands and swamps so that we can have economic development on top of the “reclaimed” “useless” swampland. They often do know that EPA Subtitle D landfills are best operated as static tombs where stable material, such as plastic, rock and glass, remains in perpetuity, not decomposing at all! They may mistakenly think that plastics are the problem with landfills because “plastics do not degrade”. Therefore disposable diapers with a plastic liner, representing only 2% of materials landfilled, but an important symbol of a “throw away society”, are perceived as a much greater problem that other landfilled materials. People simply do not know that organic materials, which degrade, are the real problem in landfills. Decomposing organics, representing 70% of all municipal refuse, cause leachate, settle, crack the clay cap, produce greenhouse gas generating methane, and are the “real” problem with landfills. The perfect Subtitle D landfill has no organic matter, only stable fill material, like plastics.

The Big Picture

Some of the new political reasons for choosing resource recovery are taking on a larger, more global perspective. While concerns remain regarding the environmental security of landfills and long term liability, other issues such as “sustainable communities” and “economic development” are increasingly coming into the discussion. Planning departments are using an economic model of community inputs and outputs where solid waste is looked upon as a resource, not a liability. Economic development officials have come to realize that resource recovery and recycling create raw materials that result in jobs whereas landfills just sink dollars into a hole in the ground. Once a government has changed its thinking to start looking at “wastes” as “raw materials”, it has the mind-set to attract environmental companies. Many jobs in the recycling field are the sort of jobs that help with the new “Green Economy”. Resource recovery also attracts many high-paying jobs as well, which further stimulate the economy.

Composting to the Rescue

The first responsibility of a public official is to make sure that a “state of the art”, air and water quality compliant composting facility is built in their community. This means an enclosed, or under-roof, fully aerated technology with process control, heat recovery, and biofiltration. Windrows are no longer acceptable and land application of partially treated biosolids is no longer acceptable. Windrows do not meet smog and greenhouse gas requirements and typically do not adequately meet pathogen destruction or water quality protection standards. In the new green-economy, “waste disposal” is no longer an option. Bio-based “product manufacturing” is the alternative. Lower cost and improved containerized composting in particular is being perceived in many regions as a type of bio-refinery, where raw “crude” organics are processed into value-added commodities. If fossil carbon resources such as oil and coal have driven the economics of the twentieth century, renewable carbon resources such as solid waste organics and biosolids may well drive the economics of the twenty-first century. The new carbon footprint calls for “sequestering carbon” as a technique of mitigating global warming, and once understood in conjunction with reducing fugitive methane, will promote the use of compost as a means of carbon storage. Compost tilled into the soil or sequestered in planter boxes is a way of transferring atmospheric CO2 into beneficial carbon in the topsoil. Compost in a community will provide economic value to a variety of horticultural and agricultural enterprises.

Compost is One Heck of a Product!

Highway departments have become some of the largest compost users as they have seen it reduce erosion, make plants more drought resistant, mitigate the effects of salt, and result in

stronger and healthier plants. Compost can be used in planter mixes in greenhouses and nurseries. Compost is an essential commodity used by organic and sustainable farms. Landscapers all over the country have learned that using compost in their projects not only increases revenues, but also results in better plant growth. Turf grass specialists, particularly golf courses, have become large compost users as they know from experience how the product helps retain moisture, loosen heavy soils, bind loose soils, reduce soil-borne diseases, and result in healthy turf grass establishment. Compost is now recognized as a low cost and environmentally acceptable way to make heavy metals less available in contaminated brownfield soils. As more and more communities look at reclaiming land that is contaminated with lead and other metals, they are learning that compost tilled into the soil can make it safe for a variety of applications, putting many of these properties back onto the tax base.

The Fugitive Methane Dilemma

Methane, CH4, is the main ingredient in natural gas and when burned, reduces virtually no ozone gas pollutants. It is considered to be a "clean fuel". Unburned, however, lighter-than-air methane rises up into the atmosphere creating ozone, contributing to smog, eventually reaching the upper atmosphere where it is a major cause of atmospheric warming. Fugitive methane is reported to represent at least ten percent of total greenhouse gas contribution, second only to carbon dioxide. Half of man made fugitive methane comes from ruminant livestock animals, mostly cows, both belching and stockpiled manure and the other half comes from landfill or windrow composting emissions generated from mismanaged organic materials. Composting manure, capturing fugitive methane in milking parlors, keeping organics out of landfills and switching windrows over to controlled composting would enable the US to meet its Kyoto emission goals without reducing a single gallon of gasoline or conserving a single ton of coal!

The Good and the Bad of Landfill Methane

The Good; The methane potential from a ton of grass clippings or most manures can be as high as $60. **The Bad;** Rated at 21 times the greenhouse gas as carbon dioxide, fugitive methane is rated a carbon deficit up to $16 per ton in the Kyoto carbon trading market. **The Good;** Landfill operators now capture much of their fugitive methane and burn it, often generating significant amounts of electricity. **The Bad;** Most landfills, however, only capture 10% of the fugitive methane generated over the life of the landfill. **The Good;** Landfill engineers are working on doing a better job at methane management by increasing methane production 600% using landfill "bioreactor" technologies that turn landfills into a wet soup instead of a dry tomb. **The Bad;** These technologies, however, often end up increasing the net volume of fugitive methane by 300% over old inefficient recovery systems by getting all waste to decompose instead of the wet material at the wet bottom of the landfill. **The Good;** Decomposed waste is more stable, takes less volume and results in longer landfill life. **The Bad;** Landfill liners and side walls are designed for dry waste, not liquids. Do we really want a lake of garbage instead of a dry tomb? Remember the news reports by garbologist William Rathje showing eighty year old hot dogs and readable newspapers in dry tomb landfills? Currently, only the wet 10-25% of the bottom of landfills where the leachate collects is decomposing into methane. The rest is a dry mass, presumably static for hundreds or thousands of years. Get it all wet by recirculating leachate, and the whole landfill mass starts producing methane. Efficiencies or bioreactors vary in estimation, but projections of 30% to 60% methane capture are common. 50% capture of six times as much fugitive methane results in three times as much methane escaping. Because landfill designers know that they are making fugitive methane worse by converting dry tomb landfills over the wet "bio-reactors". This is why they do not dare call for the end of composting

programs that keep organics out of the landfill as they know that their programs are not a solution, only an alternative.

The Good and the Bad of Composting

The rush to keep resources out of the landfill in the 1980s-90s helped create the current composting industry, growing from a estimated $50 million per year in bagged manure sales in 1970 to over a billion dollar industry by 2005! But the reputation of composting as a "clean industry" has come into question. In 2001 through 2003, the South Coast Air Quality District in Southern California (AQMD) started monitoring air emissions at three 100 ton per day composting facilities in the LA basin and found that these piles generate not only fugitive ammonia as was already recognized, but staggering quantities of fugitive methane and volatile organic compounds VOCs. It turns out that windrows are not aerobic after all, but are actually uncontrolled anaerobic digesters, producing methane a byproduct! By 2005, California passed AB1133 which gives the air quality districts the right to regulate composting operations and windrow composting in Southern California is now banned.

It turns out that the periodic turning of a pile gives the material a thirty minute burst of oxygen which generates a small burst of heat. This heat is retained in the self insulating pile. Aerobes need oxygen and generate heat. Anaerobes can not function in an oxygenated environment and generate methane. It is one or the other when it comes to decomposition. The oxygen supplied from turn is rapidly consumed, which enables heat loving anaerobes to decompose the pile, generating fugitive methane. Based upon the AQMD data, windrows produce three to ten times as much fugitive methane as sending these same organics to the landfill! A point that landfill gas recovery promoters gleefully point out to environmentalists who advocate composting as the alternative to landfilling.

Rethinking windrow composting, microbiologists and compost system designers now realize that the outer 18" of a windrow has enough air from the surface to decompose aerobically, helping to generate heat. The next 18" has insufficient air to decompose aerobically, but too much oxygen to support anaerobic decomposition. These mid range, then director of AQMD, Mary Wood, told me in 2004, that a 100 ton per day produces more smog than the El Segundo Refinery!

But where did the VOCs come from, which from an ozone perspective, are even worse? These come from stressed microbes in the no-bug zones that have neither aerobic nor anaerobic conditions. Other microbes are stressed when temperatures are too high, over 147F. These stressed microbes are known to produce VOCs instead of either heat or methane. Some of these VOCs are regulated under the 2006 Clean Air Act which makes it just a matter of time that the EPA starts regulating uncontrolled windrows as well. Regardless, the days of the passive organic matter stockpiles and windrows are numbered.

Controlled composting with full aeration does not produce fugitive methane or VOCs. Containerized composting captures leachate and recirculates it or sends it to the sewer. Controlled composting meets pathogen destruction in three days, reducing concerns over e-coli, salmonella and a variety of other manure, biosolids or food waste derived pathogens. Controlled composting prevents odors and biofilters scrub what odors remain. Containerized composting can process up to 800 tons of organics per day per acre, enabling cost-effective composting in even the most densely populated areas. Heat from controlled composting can be

used to generate electricity, heat greenhouses, water or buildings. Composted nitrogen fertilizers can be turned into non-polluting forms, providing needed nitrogen for farmers while protecting ground and surface waters.

The Public Official and The Quality of Life

Resource recovery continues to have strong environmental support as we have arrived in the twenty-first century. It has evolved from a direct cause and effect, environmental problem/solution strategy into an indispensable part of a community's economic infrastructure. Composting in particular is increasingly being recognized as a means to reduce the liability in landfills and create a beneficial product. Voters may be vague regarding the specifics of the economics regarding recycling and the science behind many environmental issues, but they remain steadfast in their support of environmental protection. People understand that their "waste disposal dollars" can be used to fund "resource recovery" facilities through private financing. Public officials have the responsibility of weighing environmental values in an era of fiscal accountability, but when they look at the larger picture of community benefits and value added products, they will be able to justify the costs of resource recovery when called upon by their constituents. In the end, resource recovery can be equated with the overall health of a community, and citizens will require their elected officials to show that they have based their decisions not just on the short term cost, but on the basis of an improved quality of life.

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