

Zero Waste: A Key Move towards a Sustainable Society

by Paul Connett, PhD

Introduction.

I have never received a formal training in waste management. What I know I have learned over the last 23 years traveling to 49 US states and 50 other countries, helping citizens fight off incinerator and mega-landfill proposals. In the beginning I brought to this debate basic chemical principles (I have taught chemistry at the high school level for 4 years and at the University level for 23 years), research and publications on the dioxin issue and a firm belief that we cannot have infinite growth on a finite planet. This chapter is an update of an essay I wrote with Bill Sheehan, "Citizens Agenda for Zero Waste: A North American Perspective." (1)

Our current age is sleep walking. Most of us living in Western societies have nearly everything our parents and grandparents ever dreamed of – except one thing, sustainability. We cannot share our current consumption patterns with the future. We are living on this planet as if we had another one to go to. A little thought should make us realize that, as far as raw materials are concerned, we simply can't run a "throwaway society" on a finite planet.

Waste is the evidence that we are doing something wrong. Landfills simply bury the evidence and incinerators (by whatever fancy name they are called) simply burn the evidence. We have to face the real problem: our task is to fight over-consumption and its most visible manifestation: the throwaway ethic. Instead of trying to become more sophisticated about getting rid of waste, we have to stop buying things we do not need, and industries have to stop making things, which cannot be reused in some way.

Meanwhile, not only is the throwaway society presenting us with a local waste crisis, it is contributing to the global crisis. It is important to see what has caused this crisis and how a Zero Waste strategy can take an important step towards addressing the issue. We need to move from a linear society to a sustainable society.

The Linear Society

Since the industrial revolution we have attempted to impose a linear society on a planet that functions in circles. Nature recycles everything; we do not. In four steps we convert virgin materials into waste. It starts with extraction, and then manufacture, then distribution, then consumption and finally waste. The more "developed" a society the faster this transformation takes place. Annie Leonard, the driving force behind the formation of the worldwide network of citizens' groups from over 80 countries dedicated to finding alternatives to incinerators and landfills (2), has produced an excellent videotape describing this process. It is called "Stuff." (3)

At each step in this linear chain there are enormous impacts on the environment. Extraction from raw materials requires large quantities of energy and in turn produces

huge quantities of solid waste, air pollution, water pollution, ecosystem damage, and massive quantities of carbon dioxide which in turn leads to Global Warming. Most of these impacts are repeated again with the manufacture of products. Then transportation between every step entails further energy use and even more carbon dioxide production and more Global Warming.

Consumption – the ultimate driver of this whole linear process - is stimulated by advertising, particularly via today's number one human pastime: watching TV. Over-advertising produces over-consumption. In the US, every seven minutes we are told that we need something. We are told that we are hungry, thirsty, too fat, too sick, sexually frustrated and need a new car! By the time a high school student leaves school in the US, he or she will have watched over 350,000 TV commercials. (4) Our children are being programmed for life, for an over-consuming lifestyle.

A lot of this consumption is driven by ever changing manufactured “fashions”. As Oscar Wilde said, “What is fashion?.. it is usually a form of ugliness so intolerable that we have to alter it every six months.” (5)

On a more serious level, Mahatma Gandhi said that, “There is enough in the world for everyone's need, but not enough for everyone's greed.” (6) More recent scientific analysis indicates that we would need several planets to provide the world's population with the typical European consumption patterns and several more if everyone consumed as much as the average American. (7)

With China, India, and Indonesia attempting to catch up with western consumption, the stresses on finite resources and global climate change threaten to become far, far worse than anything we have seen to date. It is time that we in the West set a better example. Where better to start than the one non-sustainable daily activity in which nearly every human being is currently involved – making waste? A sustainable society must be a zero waste society.

What is the Zero Waste strategy?

The Zero Waste strategy says no to incinerators, no to mega-landfills, no to the throwaway society and yes to a sustainable society. While it may sound like an idealistic goal, we can put it into a realistic time frame. We do not expect to reach zero waste next year, but we can anticipate that some communities could be very close to Zero Waste by 2020. People will quibble about how close we can get to zero but the point is to make it our goal. Put another way, let me pose this question: bearing in mind the needs of future generations, how much waste do you think is acceptable?

More than anything else Zero Waste is a new direction. We have to move from the *back end* of waste disposal to the *front end* of resource management and better industrial design. We need to design waste out of the system, and remove it from the dictionary! As Mary Lou Derventer, who along with her husband Dan Knapp, runs one of the world's

largest reuse operations (Urban Ore, see below), says “Discarded materials are not waste until they are wasted.” (7) Waste is a verb not a noun.

The Fourth R.

Most people are familiar with the 3 R’s (Reduce, Reuse, Recycle) but it is the Fourth R of Responsibility, which holds the key to sustainability. We need individual responsibility, community responsibility, industrial responsibility, professional responsibility and political responsibility.

We need community responsibility at the back end of the problem, industrial responsibility at the front end, and we need good political leadership to bring these two together. And because this issue is too important to leave to the narrow focus of “waste experts” we need every sector of the economy involved. We need to integrate zero waste strategists with farmers, educators, economists, industrial workers, architects, community developers, and social activists. In this chapter I will outline how this can be done.

Industrial responsibility at the front end.

There are three important developments industry needs to pursue: 1) Design for Sustainability, 2) Clean Production and 3) Extended Producer Responsibility.

Design for Sustainability. Right from the outset Industry needs to incorporate this new ethic. It is not enough that industry can sell its products to the present, it must design its products so that the object, or at least its constituent materials, can easily be shared with the future. (8)

Clean Production. Another important challenge in sustainable design is to eliminate as much as possible the use of toxic elements and compounds in manufacture. This includes toxic metals like lead, cadmium and mercury (which have no known biological use) as well as compounds containing the problematic elements chlorine, bromine and fluorine. These compounds are so persistent that they come back to haunt us in many ways, either by reaching the stratosphere and damaging the ozone layer or by accumulating in our body fat, and being passed by the woman to the fetus and the breast fed infant. Not only do these substances (eg polyvinylchloride or PVC plastic) pose dangers to the workers that handle them, but their dangers are exacerbated when they are burned either in accidental fires or deliberately in incinerators. (9)

Extended Producer Responsibility (EPR). Manufacturers and retailers can anticipate new laws that will force them to take back their products and packaging after the customer has finished with them. (10) Some manufacturers are well ahead of the game and have found that by recovering and reusing either the parts or the materials in their products, that they can save money, both on disposal and production costs. A very good example is the Xerox Corporation in Europe. They are using the same trucks that take their machines to 16 different countries, to collect old machines. These are taken to huge warehouses in Venray, Netherlands, where the machines are stripped down. The

company is recovering 95% of the material either as reusable parts or recyclable materials. This saved Xerox \$76 million in the year 2000. Other companies are also reporting huge savings when embarking on zero waste strategies. (11)

Solid waste is the visible face of inefficiency.

Community Responsibility at the back end.

Community Responsibility begins with source separation and door-to-door collection systems. These typically involve three or four color-coded containers. This varies from a once a week collection of three containers in the city of San Francisco (“The Fantastic Three”) (12), to 4 containers used in several cities in Italy, where the collection of specific containers takes place on different days of the week (e.g. Capannori, near Lucca). (13)

Basically, in all systems one container is used for the kitchen waste, one or more for the recyclables and a third for the residuals.

Although, not recognized for 10 years or more in North America, where the “blue box” program for recyclables was embraced by many municipalities and enthusiastically accepted by the majority of citizens, it is the container for the organics, especially the kitchen waste, which is the most important division.

The organics. It is the organic fraction which causes the odors when left around in cities like Naples. The organic fraction also causes methane and leachate generation in landfills. But perhaps the most important reason that we need to collect *clean* organic waste is that it is needed by farmers to replenish their soils of depleted nutrients. Compost also has a distinct advantage over incineration of not only reducing the global warming involved in the production of synthetic fertilizers but also sequestering the carbon in wood and other cellulosic fibers thereby delaying the release of global warming carbon dioxide. With incineration the conversion of cellulose and other organic material to carbon dioxide is immediate.

In San Francisco the kitchen and other organic waste is sent to a large composting plant located approximately 100 km from the city. The site is surrounded by farmland and local farmers use the compost to produce fruit, vegetables and wine, which is sent back to San Francisco. This provides a very positive model for other cities. Instead of exporting their mixed waste to landfills and incinerators located in rural areas, which causes so much intense opposition from citizens and farmers, municipal decision makers should work with farmers to produce together (i.e. co-composting the organic fraction from the municipal discard stream with the agricultural waste from farming) a compost product that everyone can live with and benefit from. Of course, farmers do not want low-grade material and the key will always remain the ability of cities to organize their citizens to separate their organic discards from plastic and other contaminating materials. In this respect, the city workers who pick up this material are an important part of the education process. (13)

In Italy, it was the need to generate clean organics which drove the development of porta-a-porta collection systems. The large drop off containers traditionally used in Italy for both sorted and unsorted materials do not get a clean enough product for agricultural use. (13)

A large fraction of the kitchen waste in San Francisco comes from restaurants and hotels and the city has a team of workers educating kitchen staff to optimize their collection of clean material. The restaurants and hotels have an incentive to do this because the collection fees they pay for clean organic waste are 25% cheaper than they pay for the collection of mixed waste. (12)

Many towns, where householders have more space, have taken a simple preliminary step before building a centralized composting facility, of encouraging as many of their citizens as possible to compost their own kitchen and yard waste in backyard compost bins or vermiculture boxes. (14) Some provide the kits either for free or at reduced cost.

Zurich, Switzerland, which has a very dense housing situation, has encouraged “community composting”. In this program a number of households (ranging from 3-200) share the responsibility of running a simple compost system. These do not occupy a large area and can be located in city parks or in the space between high rise buildings. Currently the city boasts over 1000 community composting plots, which in total are taking care of 50% of the city’s household organic waste. When I asked the person who pioneered this what the best thing was about the program he said that it was the social ramifications. “It helps people fight the anonymity of living in a big city. People meet over the compost pile!” (15)

The recyclables. The recyclable materials are destined to go to Material Recovery Facilities (or MRFs) of which there are hundreds of successful examples around the world. Their function is to separate the paper, cardboard, glass, metals and plastic and prepare them to meet the specifications of the industries, which will use these secondary materials to manufacture new products. Some of these plants are built to handle a single stream of mixed recyclables (e.g. Perth, Australia) and others deal with two streams: paper products in one stream and bottles, cans etc in the other (e.g. Edmonton, Alberta, Canada).

Because of their high employment demands and the economy of scale, these plants are best located in large cities, which are also usually more conveniently located to industries which can use the secondary materials. This sets up an ideal partnership between urban and rural areas. The cities should export their organics to the rural areas and the rural areas should transfer their recyclables to the cities.

In Nova Scotia nearly all the recyclables are used in Nova Scotia’s own industries. This has not only stimulated their economy but has produced a total of 2000 new jobs in these industries (see below). (18)

The Residuals. The separation of clean organics and marketable recyclables takes us closer to a sustainable future, but the residuals do not. These are our failures. Before we deal with these we need to examine other things we can do to minimize their production.

Local and National Waste Reduction Initiatives. There are many unnecessary items – especially packaging - which have entered our lives. As these pile up in landfills more and more governments and private enterprises are taking steps to reduce their use and production. Here are some examples.

In Ireland, the government introduced a 15-cent tax on each plastic shopping bag used in shopping malls. Much to the surprise of everyone, within one year, this measure reduced the use of these bags by 92% and the other 8% put over 12 million Euros into funds for other recycling initiatives. (19)

In Australia some 80 towns have banned the use of plastic shopping bags completely. As a result of these kind of measures more and more people are being persuaded to use reusable cotton bags. These have the advantage of carrying the slogans and messages of the sponsoring organizations. Bans on plastic shopping bags are spreading throughout the world (20) and even large cities like San Francisco have introduced them. (21)

In some supermarkets in Italy dispensing systems are being introduced which allow customers to reuse their own containers for various liquid items like water, milk, wine, shampoo and detergents. Other dispensing systems are being used for solid items like grains and cereals. The Friends of Beppe Grillo group in Biella (near Turin) has started mapping supermarkets that provide these services in their area and throughout the country. (22)

A little creativity at the front end can save millions at the back end.

It wasn't so long ago that citizens remember that their beer and soft drinks came in reusable glass bottles. More and more these have been replaced - supposedly for "our convenience" – by disposable bottles. However, in one major jurisdiction – the province of Ontario in Canada – this has not happened for beer. For over 50 years, the beer industry there has used refillable glass bottles. Today, according to the director of the "Beer Store" over 98% of these are recovered. Each bottle goes around 18 times and there is a calculated saving of 13 cents per serving compared to disposable glass bottles. Moreover, over 2000 jobs are involved in collecting and cleaning these bottles. Most importantly this whole operation is conducted by the beer industry itself. There is no cost whatsoever to Ontario communities. They do not have to collect the bottles nor attempt to landfill, burn (!) or recycle them. The beer industry has internalized its packaging costs. So here we have essentially a zero waste operation and it has been going for over 50 years! (23)

Reuse, Repair and Retraining Centers. Another important reduction strategy is to encourage the establishment of reuse, repair and retraining facilities. There are many successful examples of such operations running either for profit or as non-profit entities.

An example of the former is Urban Ore in Berkeley, California. Run by Dr. Dan Knapp, a retired sociology professor and his wife Mary Lou Derventer, this operation has been running for over 25 years. It currently grosses nearly \$3 million and has over 30 full-time employees who are well paid and have a good benefit system. Some of the employees have worked for the company for over 20 years. The company accepts anything reusable and lays out the goods like a department store. They will pay for valuable items but more often than not people are only too happy to see their second hand appliances and furniture used again and not simply crushed and sent to a landfill or burned in an incinerator. A very profitable part of this operation is the section set aside for building materials (timber, bricks, bathroom fittings, doors and windows etc) which come from deconstruction or renovation of old buildings. More and more builders are dropping off their recovered materials while they are picking up reusable items for new projects. (24)

A very good example of a reuse operation run by a not-for-profit agency is “Recycling North” in Burlington, Vermont. This operation grosses nearly \$1 million a year and employs 27 people. They specialize in fighting poverty both by providing goods free for people (they are given coupons to use for essential appliances by the Social Services department) and with job training. People literally off the street are trained to repair goods in five different categories: large appliances; small appliances; electrical goods; electronics and computers. After six months the successful trainees are issued with certificates and given help to secure full-time employment. (25, 26)

Recycling North also receives some higher priced items by allowing people to treat the objects they give as tax-deductible donations.

Both Urban Ore and Recycle North offer something more than good bargains. People enjoy visiting these facilities. They have become centers for community interaction and activity. Having places like this where people can meet and interact is invaluable and like the community compost piles in Zurich help to fight the anonymity of living in a big city.

In an ideal world such facilities would be located throughout the city as a means to stimulate community development – a conscious effort to remake the village within the city. To this end some space should be set aside for community meetings and entertainment.

These operations work so well because reusable items are valuable. Recyclables are high volume, low value; reusables are low volume, high value. Reuse and repair centers will thrive financially as long as there are people who enjoy searching for a bargain. Recycle North is happy to provide those who would like to set up operations like theirs with advice on how to do so. (25)

Deconstruction. Going hand in hand with reuse and repair operations is the deconstruction – as opposed to demolition - of old buildings. Deconstruction takes longer but it yields more employment and valuable materials. In some cases recovered materials like doors and windows can be reused as they are, in other cases the materials (such as lumber) can be used to make new items like furniture. (24, 26) The latter stimulates the

development of further businesses. An excellent example is Renovators Resource in Halifax, Nova Scotia, which sells beautiful furniture made from materials ranging from old window frames to church pews. (27)

Another niche industry created from the notion of fighting waste are businesses which offer to reuse and recycle the items and materials yielded by the renovation of hotels and office buildings (e.g. Sonrise Recycling in California). Often such renovations produce a pile of rubbish in containers outside the building. Sometimes these are scavenged by those who realize their value, but it would make more sense for the hotel or office owner to call in these recovery firms before the builders go about their work. In this way the items can be removed in a careful way to minimize damage and contamination. Also these niche companies relieve the hotel or office manager of finding a home for these objects and materials. (28)

Finally, after removing the recyclables and compostables, maximizing waste reduction initiatives and stimulating the reuse and repair of objects and deconstruction, we are left with the residual fraction. Today this fraction is either sent to a landfill or an incinerator, but in the zero waste strategy it is not. But before we deal with that, there is still one more step we can take to minimize the residual fraction - the pay by bag system.

Pay by bag systems. The idea here is to encourage citizens to maximize the diversion possibilities, by penalizing the production of residuals. Typically the recyclables, compostables are picked up for free, or at a flat rate (sometimes absorbed in local taxes) but an extra charge is applied to the residuals. This can be done in several ways: in some communities the residuals are weighed, in others stickers are purchased to place on each bag placed on the curb, or special plastic bags have to be purchased. This one simple fiscal step has led to significant reductions in many jurisdictions (29, 30).

The Residual Separation and Research Facilities. The residual fraction is the key difference between waste disposal (landfills and incinerators) and the zero waste strategy. The former attempts to make the residuals disappear, the latter needs to keep them very visible. The residual fraction represents our non-sustainable mistakes, either through citizens' poor purchasing decisions or through poor industrial design. We need these residuals kept visible if we are to move towards a sustainable society. We need to study our mistakes.

Thus in the Zero Waste strategy the residuals need to be sent to a Residual Separation and Research Facility and not directly to a landfill.

Residual Separation. In Nova Scotia, the bags containing the residuals are not sent directly to a landfill but to a building located in front of the landfill. On arrival the bags are opened and the contents tipped onto conveyor belts, where well-protected and trained personnel pull out bulky items, more recyclables and more toxics. The dirty and untouched dirty organic fraction reaches the end of the conveyor belts. It is then shredded and biologically stabilized either by a second composting operation, in the case of Nova

Scotia, or an anaerobic digestion system in other facilities. The point of this process is not to produce a product for sale (it is contaminated) but rather to ensure that much of the organic degradation occurs above ground in a controllable fashion before it takes place underground in an uncontrollable fashion. Nova Scotia has pioneered this approach with some success. Their resulting landfills are far smaller and less problematic than the raw waste landfills that preceded them or the ash landfills needed by incinerators. (18, 31, 32)

Traditionally the approach to resolving the problems posed by landfills has been to apply more and more sophisticated engineering to landfills in an effort to contain both gaseous and liquid effluents (leachate). This has involved daily cover, methane capture, and lining and leachate collection systems. Essentially, the goal has been to control what comes out of landfills, willy nilly of what is put into them. The Zero Waste approach sets out to control what goes in. If we can get very good at keeping both toxic and biodegradable materials out of landfills, we might be able to return to the notion of filling holes in the ground like old quarries without environmental complications. With this screening approach we can certainly make landfills much smaller than raw waste landfills and a lot safer than incinerator ash landfills.

However, there is more we need to do in a Zero Waste program than landfilling this non-toxic material. We need to carefully observe and study the currently non-recyclable fraction left in the residuals. This gives us our first opportunity to integrate zero waste with the educational system.

The Residual Screening and Research Facility. We need to build a research center at the Residual Screening facility. Ideally, this would be an annex of the local university or technical college. In this research center Professors and students with various interests in a sustainable future (industrial design, ethical advertising, urban and community development, economics, environmental management and global degradation) could study the non-sustainable mistakes of today's society and propose future solutions.

Such research activities and recommendations could involve suggestions for:

1. Improving capture rate of reusables, recyclables and clean compostables in the door to door collection systems
2. Advocating waste avoidance strategies for local businesses
3. Developing some local uses for some materials
4. Developing alternatives to some of the toxics in products (batteries, paint, solvents etc)
5. Offering better industrial designs to industry on packaging and products

It is the Residual Screening and Research Facility that represents the key interaction between individual, community and industrial responsibility for a sustainable future. It takes the form of this simple but very important message from the community to industry: "if we can't reuse it, recycle it or compost it, you shouldn't be making it and we shouldn't be buying it. We need better industrial design for the 21st Century."

As we think about integrating waste (or rather resource) management with the educational system, it is important to stress that waste is too important matter to leave to waste experts.

The attraction of Zero Waste as a tool to advance towards sustainability is that every human being is involved with the problem, every day. Every day we make waste we are part of a non-sustainable way of living on the planet and every day we “unmake waste” by separating our discarded materials, and by avoiding unnecessary products and packaging, we are part of a sustainable way of living on the planet.

Moreover, the Zero Waste movement can be linked to the other demands of a sustainable future. Waste is too important to be left to “waste experts.” We need to integrate those working on this issue with many other sectors in society. It is easy to see how this can be done: composting can be linked to sustainable agriculture; anaerobic digestion can be linked to sustainable energy; deconstruction can be linked to green architecture; the residual screening and research facilities are clearly linked to education and better industrial design; the reuse and repair centers can be linked to community development and the whole program can be linked to sustainable economic development and job creation.

Zero Waste Initiatives around the world.

Canberra, Australia

In 1996, Canberra became the first city in the world to enact a Zero Waste law. (33) The law required the government to produce “No Waste by 2010.” In 2004, when I last visited the city it was achieving over 70% diversion, but to be fair this figure was largely influenced by the huge diversion of both yard waste and (very heavy) building and construction debris. (34) The most exciting part of their program was the establishment of a “Resource Recovery Park” in an effort to co-locate all the industries which can make products out of separated materials as well as those marketing reusable items like “Aussie junk” and “Revolve.” Sadly, of late the program has run into some setbacks. (35)

New Zealand

Over 70% of communities have declared a Zero Waste strategy, a program which has now been endorsed by the national government. (36)

Nova Scotia, Canada

In the late mid-1990s Halifax tried to expand its landfill. This created a huge uproar from local citizens who complained bitterly about the terrible odors emanating from the site. Then the municipality proposed a large trash incinerator (750 tons a day). Again there was an uproar and the project was rejected. At this point the government handed the problem over to the citizens and said “You don’t want landfills and you don’t incinerators, tell us what you do want. You design the program.” (18, 31, 32)

The citizens accepted the challenge and the government provided them with all the consultants' reports. The citizens' opted for one of the programs listed in the report prepared by Sound Resources out of Seattle. (37) This plan involved source separation and door to door collection of recyclables, organics and residuals. The citizens made two changes to the report. 1) Everywhere the report used the word "waste" they changed this to "resources." 2) Because of the bitter experience with the old landfill the citizens required that no organic waste go into the landfill without processing. This drove the construction of the residual screening facilities described above. (18, 31, 32)

This program has proved very popular and successful. After 5 years the whole province had achieved a 50% diversion rate – and became the first province in Canada to do so. Halifax, has achieved 60% diversion rate. (18)

In the process of doing this 1000 jobs were created collecting and treating the discarded materials. These jobs were generated in materials recovery facilities, a tyre recycling plant, a waste paint recovery plant, deconstruction and reuse operations, drop off facilities for toxic items like batteries and solvents, composting facilities, the approximate 200 "eco depots" which redeem the containers, with a deposit on them, administration and research. (18)

In addition another 2000 jobs have been created in the industries reusing the collected material. Nearly all the separated materials are re-used in Nova Scotia's own industries.

The program has been the subject of a GPI (genuine progress index) analysis, which unlike other indices like the GNP (gross national product) includes estimated social benefits. The result of this analysis is hugely positive largely driven by the social consequences of generating so many new jobs. (38)

It is worth remembering at this point that the much touted trash incinerator in Brescia, Italy which cost 300 million Euros to build has only generated 80 full time jobs!

Prince Edward Island, Canada

This Canadian province has door-to-door collection of recyclables and compostables from every household on the island. (39)

Communities near Toronto, Canada

The city of Markham (north of Toronto) has diverted 70% from landfill in 2 years. (40)

Ward 3 in Pickering, Ontario in a pilot project achieved a 73% diversion rate with door-to-door collection of recyclables and compostables.

Boulder, Colorado, US

EcoCycle in Boulder, Colorado has a very long history of recycling. Their current director, Eric Lombardi is one of the gurus of the zero waste movement. Their website is a mine of information from the theoretical to the practical. (41)

Communities in California

Since the passing of a state law requiring communities to divert 50% of their trash from landfills by the year 2000, hundreds of towns and cities have achieved this goal. (42) After doing so, some of the more enlightened municipal bodies asked, “Why stop at 50%, why not 60 or 70% or higher? Why not shoot for a 100%?”

Both Del Norte, Almeida and several other counties have declared a Zero Waste strategy. (43) Most impressively, the city of San Francisco, with a population of 850,000 and with very little space, is among the cities which have adopted a zero waste goal by the year 2020. They are currently diverting over 60% and their target for 2010 is 75%. (12, 21)

Italy

Italy has pioneered some of most cost effective and rapidly applied “door to door” collection systems in the world. The program began when farmers approached Enzo Favorino and his colleagues at the Agricultural School in the Parco Monza, near Milan, and asked where they could get more organic material for their soil. Enzo replied that there was plenty of organic material in the domestic waste stream but it could only yield compost good enough to use in agriculture if it was collected separately at source. This would necessitate door-to-door collection. Thus begun the very popular “porta a porta” collection system in Italy. (16)

As of early 2008, over 1000 communities in Italy are now achieving more than 50% diversion using porta a porta collection systems. (16)

In Lazio province several small towns (e.g. Sermonetta) achieved over 60% diversion in one year. (16) In Novara, a town near Turin, with a population of 100,000 achieved 70% diversion in just 18 months. (44) To the best of my knowledge for a town of this size to achieve such a diversion rate in such a short time is a world record.

Small towns near the city of Salerno have also achieved over 70% diversion. (16)

In the Treviso region 22 communities in the Priula Consortium in 5 years have achieved an average diversion of 76%, with four towns over 80%. The economics of this program have been carefully monitored and the programs with separation are actually cheaper (74 Euros per ton) compared to programs without separation (93 Euros per ton). (45)

In Villafranca d’Asti (population 30,000) in the province of Piedmont have achieved an 83% diversion. (46)

On February 24, 2007, Capannori near Lucca, became the first community in Italy to

formally declare a zero waste strategy. In a pilot port a prota collection system for one quarter of the city they are achieving a massive 83% diversion. Furthermore they have analyzed the remaining 17% - the residual fraction. The top three items in this fraction are 1) leather and textiles; 2) disposable diapers and 3) kitchen waste. Currently they have introduced reusable diapers in their supermarkets, improving their capture rate for the kitchen waste and are looking for local uses for the leather and textiles. (13)

Elsewhere in Europe communities have adopted a zero waste strategy and are achieving substantial reductions. More details can be found on the Zero Waste International Alliance web site. (www.ZWIA.org) In the comments above I have focused on programs in communities and countries I have actually visited.

Comparing Incineration and the Zero Waste Strategy.

It is hard to understand how any rational person living in the 21st Century, and facing the critical need to develop sustainable solutions, would countenance the squandering of financial resources on incineration, but here is a simple comparison between incineration and the Zero Waste strategy.

Incineration converts three to four tons of trash into one ton of ash that nobody wants. Zero Waste converts three tons of trash into one ton of compostables, one ton of recyclables and one ton of *education*.

With Zero Waste we have the potential to educate every citizen, every decision maker and every manufacturer. Again, the message to industry: “If we can’t reuse it, recycle it or compost it, you shouldn’t be making it” and the message to ourselves, “If we can’t reuse it, recycle it or compost it, we shouldn’t be buying it!”

As far as global impacts are concerned a combination of recycling and composting saves three to four more energy than generated by an incinerator producing electricity. (47) Some of the comparison for individual materials are staggering. For example, recycling PET plastic (commonly used in disposable water bottles) saves 26 times more energy than burning it. (48)

One European report indicates that a combination of recycling and composting produces 46 times less global warming gases per tonne of waste processed than generated by an incinerator producing electricity. (49, 50)

As far as local economy is concerned the zero waste strategy is cheaper and produces far more jobs than incineration. Moreover, the money spent on the program stays largely in the local community whereas a lot of the money spent on the incinerator leaves the community. Dr. Robin Murray, a professor of the London School of Economics, has explained the extraordinary benefits to the local economy of a Zero Waste strategy in his book “Creating Wealth From Waste.” (51)

Conclusions

Incineration is not necessary. There is a better alternative strategy, which is not only better for our health, but is better for the local economy, and for our planet.

However, there remains an obstacle, which I call “the bad law of pollution.” When we compare communities, provinces or countries, “the level of pollution increases as the level of corruption increases.” The more corrupt your community the more polluted it will be. Nowhere is this more apparent than with the city of Naples, Italy.

Fortunately, there is “the good law of pollution,” which states that “the level of pollution decreases as the level of public participation increases.” In short, we need to clean up the political system in order to clean up our environment.

Nowhere is this corruption more apparent than the continued promotion of mega-landfills and incinerators. A few people make a huge amount of money from building and running these entities but the rest of the public foots the bill in countless ways.

However, the one good thing that comes out of these projects is that it galvanizes the public into vociferous opposition. It is this passion, and the networking it generates, which provides the push for the alternative zero waste strategy. In the last few years in Italy this networking has received a huge boost from Beppe Grillo, a former TV comedian who is capable of drawing 10,000 people at a time to meetings where he uses his wit (along with recruited scientists) to educate millions on waste and other pressing social and technical issues. (52)

Today, nowhere is the struggle between the mindless political pressures for incineration and the counter citizen pressure for Zero Waste more apparent than in Italy. The world watches its response to the Naples crisis. Will invested interests succeed in getting communities to build incinerators or will its citizens demand the kind of creative leadership in these matters that the world once saw from Italy in artistic and scientific matters during the Renaissance and the Scientific Revolution?

Three final messages.

I always end up my public presentations with three short messages.

The first message is directed towards CITIZENS. Don't let high paid consultants take either your common sense or your democracy away from you.

The second is directed towards POLITICIANS. Put your faith back in people. Without all waste solutions will fail. Give us source separation and door to door collection systems and we will not let you down!

The third is for ACTIVISTS. Have fun! This is essential if we are to avoid burn out.

I remember 23 years ago when I first got involved with waste and I was in heavy demand to give talks, I remember I said to my wife: “When this is over I will paint the kitchen.” In those days I saw my involvement as an aberration from normal life. Now I realize it is not an aberration: I am doing what I believe I have to do and this has become my normal life. There is no “after”. This is it. Eventually my kids grew up and they painted the kitchen!

To sustain a long involvement you have to enjoy the struggle and hopefully enjoy the people you struggle with. I count myself privileged that I can use my science to help people and the people I work with around the world are some of the very best. They are not involved for money or power but because they have a concern about their kids, their community and their planet.

Since I started my waste journey 23 years ago we have seen the advent of the internet and emails and it is now possible to share information and experiences with everyone in the ever growing network of those fighting against waste and fighting for sustainability. Check out the websites of GAIA (1); the Grass Roots Recycling Network (2) and the Zero Waste International Alliance (3) and Friends of Beppe Grillo (4).

Solving the waste problem is not going to be easy. The three alternatives of incineration, mega-landfilling and the Zero Waste strategy, all present their own set of problems. However, the difference with the Zero Waste approach is that it takes us in the right direction. Thus it makes far more sense to struggle to make this approach work because it is the only one which takes us towards a sustainable future.

Postscript: Frequent arguments against a zero waste strategy and my responses.

1) Zero Waste is not practical.

Response. One of the greatest strengths of the Zero Waste Strategy is that it is extremely practical. It is far cheaper than incineration, and cheaper than state of the art landfills. It does not involve the construction of highly problematic and complicated machinery. Local construction firms can easily handle the building of both recycling plants and composting facilities and to build them quickly. Such facilities excite far less political opposition which means that they can go into operation a lot faster.

2) Zero Waste might work in small communities but not in large cities.

Response. It certainly requires more effort, creativity and leadership, but a number of large cities have already embarked upon Zero Waste programs. These include Canberra (Australia); San Francisco (US); Seattle (US) and Toronto (Canada). At the very least programs can be initiated in all the smaller communities which make up the greater metropolitan areas. Within the city themselves special efforts can be made (like San Francisco) to organize the separate collection of clean kitchen waste from restaurants and hotels. Moreover, large cities allow for the building of huge materials recovery facilities with their attractive job creating opportunities for the inner city unemployed. As far as

collection from problematic high rise buildings is concerned it might prove cost effective to pay janitors or building supervisors an extra payment to organize residents to separate cleanly. As in Zurich the plus side of any organization of this kind is that it will help to generate social contacts. The strategic placement of job creating reuse and repair centers throughout the city could achieve similar ends as well providing the nucleus for both user friendly education and inspiration throughout the city. This may not be easy, but who believes that reversing over 200 years of non-sustainable material use was going to be easy?

2) Zero Waste does not achieve substantial diversion from landfills quickly enough.

Response. We have seen throughout Italy and some other countries that huge diversions can be achieved very quickly with door to door collection systems combining both the pick up of the separated recyclables and the clean compostable fraction (i.e. kitchen waste). For example Novarra, a community near Turin with a population of 100,000 has achieved a 70% diversion in just 18 months. Achieving further reductions though industrial responsibility will take longer, but even if a community builds an incinerator only a 75% reduction can be achieved because of the need to landfill the residual ash produced.

3) Zero Waste does not get rid of landfills.

Response. True but the goal is to reduce their use by close to zero by 2020. Incineration does not get rid of landfills. A landfill is still needed for the residual ash and the non-combustible items. As it takes at least 25 years to pay off the massive debt incurred with the building of an incinerator, it must be run at an optimal level to maximize revenues from the tipping fees and the generation of electricity. Thus any attempt to reduce the dependence on incineration results in a penalty. There need be no penalty as efforts to reduce, reuse, recycle and compost reduce our dependence on landfilling.

4) Zero Waste is good but it makes more sense to combine it with an incineration of the residuals.

Response. This approach is usually referred to as “integrated waste management.” However, the notion of combining an extremely costly incinerator with a low budget recycling and composting program is somewhat naïve. If a huge amount of economic (and political) capital has been put into an incinerator, this is the component that is going to get the lion share of the discarded materials. Furthermore, by burning the residuals a great deal of bad packaging and product design becomes invisible, thus removing the pressure for change among manufacturers. This is not the case if the residual landfill is preceded with a Residual Screening and Research Facility where the current bad design and purchasing habits are made visible and studied.

However, if people are attracted to the notion of “integration” then the sensible thing to do is to integrate in time not space. In other words, put the decision to build an incinerator on hold and proceed with an intensive effort to maximize reduction, reuse,

recycling and composting and see how far one can get in say 5 years. At this point the idea of an incinerator can be revisited to see if is still attractive or needed. Such a decision will be better informed with a clearer notion of what materials are left over.

The Seattle situation offers an interesting illustration of this approach. In the late 1980s the city was considering building a huge incineration. Four sites in the city were chosen. Each site generated a great deal of public opposition. During the furor the mayor called in his consultants and asked them this question: "How much diversion from landfill could we achieve if we spent the same amount of money on source separation, recycling and composting that we anticipate spending on the incinerator?" The consultants reported back that over 65% of the waste stream could be diverted for LESS money than an incinerator would cost. The mayor then put the incinerator project on hold and went to the people and said words to this effect: "You've told me you want recycling and composting. Fine that is what you can have but you are the key players in making this work. I have put the incinerator on the shelf, but if you fail to deliver then we will take it off the shelf." So far Seattle has achieved over 50% diversion, has adopted a zero waste strategy and shows no indication of revisiting the incinerator proposal.

5) The components of Zero Waste might work in some cultures but not in "ours."

Response. I have been told this in nearly every country I have visited and spoken on these matters. However, I have yet to find any people who, when given the opportunity to participate in a well designed, well organized and well publicized source separation program, have let their leaders down. In my view people are not the problem. The real problem is a lack of leadership; a lack of political will. This was really well illustrated to me in a recent visit to the province of Pordenone in Italy. There the province has the diversion rates for each of its towns. The rates vary from 16% to over 70%. Sometimes these towns are next door. To me that is clear evidence that the key determinant is leadership not culture. It is hard to imagine that cultural attitudes vary so steeply over such short distances and in such a checkerboard fashion.

6) One of the key components of Zero Waste is industrial responsibility, how can local communities pressure or influence industries on this matter?

Response. This pressure becomes easier and easier to mobilize as more communities adopt zero waste and achieve large diversions. After capturing the high moral ground these communities become more and more frustrated with the items that they cannot reuse, recycle or compost and are ready to put pressure on industry to play their part in this effort. This can include pressure on local supermarkets to introduce dispensing systems enabling customers to refill reusable bottles for shampoo etc. Large well known companies are not immune from public pressure. Many spend a fortune on creating their "eco friendly" image and can be acutely embarrassed by citizen campaigns to reject their non-recyclable packaging or throwaway products. Such embarrassment can reach national proportions when communities network with each other. A more positive approach is to put the spotlight on companies that are making an effort to do it right. Good political leadership can also spearhead taxation on non-sustainable packaging as in

Ireland with the 15 cent tax on plastic shopping bags (discussed above).

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