

Understanding waste – the first step in solving waste crisis (in Sri Lanka)

By Asitha Jayawardena
BSc Eng, MPhil

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The so-called story of “waste” need not be a stinking one. We have deliberately made it to stink. We simply throw away a lot of things branding them as “waste”. The result is a host of interconnected problems – economic, environmental and social – which, together, nurture an ever-growing waste crisis that has no solution in sight. Perhaps there is a solution, right under our noses and we fail to see it. Hence the need for proper understanding sans emotions!

“What we call ‘waste’ is not really waste but raw materials and energy sources,” says Professor Ajith de Alwis (Head, Department of Chemical & Process Engineering, University of Moratuwa, Sri Lanka, www.mrt.ac.lk). No matter where we are – at home, at work, at hospitals, in school, on the street, at events, etc – we throw away lots of things that could have been made useful as raw materials and energy sources. We must handle waste – or rather all the stuff we term ‘waste’ – in an intelligent manner.

Based on a discussion with Professor Alwis, this article firstly looks at the range of options available under the “waste management hierarchy”, then discusses briefly each option, and finally highlights the importance of the contribution of all of us for a successful endeavor on intelligent waste management.

Waste management hierarchy

What should we do about waste? Disposal? Throw away?? Not really! In fact, disposal is the least preferred option and it should be considered if everything else fails. Unfortunately, at present, what should be the last option has become our Nation’s first option!

A pyramid called “waste management hierarchy” presents a range of options available, roughly in the order they should be considered if the idea is intelligent waste management. There is no one ‘super’ solution i.e.; the magic bullet! We should formulate instead an integrated solution through intelligent choices, depending on the factors at

hand such as the type of waste. This is not rocket science, but simply disciplined living.

The options presented in the waste management hierarchy, in the preferred order of consideration, are:

1. Avoid waste
2. Reduce waste
3. Reuse waste
4. Recycle waste
5. Recover energy or minerals from waste
6. Dispose of waste

As highlighted by examples in the Figure of the Waste Management Hierarchy, the solutions are not complex.

If possible, avoid waste in the first place. Then there won’t be any waste problem at all. This is the most preferred option. Unfortunately, however, we cannot avoid waste all the time. In day-to-day life, reduce waste generation and reuse materials and equipment so that less needs to be produced. The next two options, namely recycling and recovery (i.e., co-processing), allow us to utilize the energy and raw materials already embedded in waste. Although they are rather sophisticated and industry-based and require special facilities, there are ways we can promote these two options among the industries. Disposal is the final option, which should be considered only if the others fail.

This waste management hierarchy clearly displays that, instead of blindly disposing of waste, we should make maximum use out of it in a safe and environment-friendly manner. In fact we are so deeply buried in a stinking waste crisis mainly because we try to find a solution exclusively through disposal – the least preferred option! It’s time we give up waste disposal and work our way out of the waste crisis through intelligent waste management.

While preventing harmful impacts on the environment and our health, we can use the waste management hierarchy to save money, preserve natural resources and mitigate the energy crisis.

Now we consider the waste management options in more detail.

Option 1: avoid waste

Avoiding waste is the most straightforward and effective approach although it is not possible in many circumstances.

We can avoid waste in simple ways. Use mugs instead of disposable cups and pack lunch in reusable containers instead of disposable ones. Save information and documents electronically and proof documents on computer. Reducing errors by planning and thinking ahead – just think how much waste can be avoided!

Option 2: reduce waste

If you cannot avoid, reduce! Source reduction means reducing the amount or toxicity of waste before it is ever generated. It takes place before materials are identified as waste. We can reduce our potential for waste generation by reducing our consumption of materials and controlling our ever-growing appetite to new things.

Reducing waste is not difficult if we think for a moment. Packaging material lavishly contributes to the waste generation. When you shop, avoid products with excessive packaging or in sachets. Prefer multiuse items and packing instead of single use ones. Buy food and other stuff in bulk and avoid food packaged in individual servings. Buy durable good quality products that will last a long time. Prefer rechargeable batteries. At work, use both sides of paper.

Option 3: reuse waste

Reuse means that a product is used more than once and the subsequent uses may be for some other purpose. Reusing repaired products is generally more desirable than merely throwing them away as “waste”. By using goods and materials again and again, we can reduce the need for new ones and can save precious natural resources and energy required for their production from the first step.

Be a bit innovative and you will discover many avenues leading to reuse. Reuse the bag of your lunch packet; reuse cardboard boxes for shipping materials; and use jam jars as toothbrush holders. Donate the clothes and books you don't want to charities because

someone else is likely to be badly in need of them.

Option 4: recycle waste

Recycling either turns waste into a new version of the same product or creates an altogether different product out of waste. Recycling prevents materials from being disposed of as waste and put them into use. Thus this method makes maximum use of the materials and energy consumed for making a product in the first place.

Recycling requires an additional amount of energy and resources, but less than the full amount required for production of the same goods from the very first step out of virgin materials. It also reduces production-related emissions. Recyclable materials can be utilized again and again without any significant loss in quality or quantity. Today, in design, the idea is to “Design for Recyclability”.

A wide range of products and materials are recyclable. Prominent ones include glass, paper, plastics and metals. Glass, for example, can be recycled into various other products ranging from glass bottles to filtration media for water utilities. It is theoretically “infinitely recyclable” and its structure does not deteriorate when reprocessed. Recycling waste glass utilizes the raw materials already consumed and requires less energy than to melt down the original raw materials when making glass from the very first step. For every ton of recycled glass used, 1.2 tons of raw materials and 135 liters of oil are saved.

Paper can be recycled into more paper or other uses, such as insulation, packing material and office supplies. Recycling paper can save energy while reducing adverse effects on the environment. In papermaking, the major share of energy consumption is for pulping to turn wood into paper. In paper recycling, input is not wood but waste paper, paving the way for an enormous energy saving. Every ton of paper used for recycling saves 30,000 liters of water and 3500 kWh of electricity, and lowers air pollution by 95%. Today, in Sri Lanka, saving energy means a lot to the national economy.

Plastics can be recycled into a wide range of products, such as carrier bags, PVC sewer pipes, flooring and window frames, compact disc cases, fencing and garden furniture – mixed plastic waste can be made into plastic lumber. Recycling plastics saves energy and

reduces emissions. It contributes to energy conservation in two ways. Firstly, since oil is a raw material in plastic making, recycling plastics saves oil. Secondly, producing recycled plastics saves two thirds of energy consumption. For example, recycling a single plastic bottle can save energy adequate to light a 60W bulb for 6 hours. Moreover, plastics' recycling emits only a third of sulfur dioxide and half the nitrous oxide when compared with plastic making. In Germany, recycling rate for plastics is as high as 70%.

Composting is Nature's way of recycling. It decomposes and transforms organic material into soil-like product called humus, which is a good fertilizer. Compost is an attractive and healthier alternative to expensive chemical fertilizer. A major share of solid waste in Sri Lanka is biodegradable and hence is suitable for composting. Adding compost as a soil amendment will help in many ways the productivity of soil.

Although recycling usually requires special industrial facilities, we can contribute to recycling by buying recycled and recyclable products.

Option 5: recover energy and raw material from waste

What we throw away as waste has energy and raw materials embedded in them. For example, wastes such as paper, plastics and textiles possess high energy content. Recovery of such embedded energy and raw materials will reduce the need for energy and raw materials at the expense of natural resources.

Co-processing is a widely adopted recovery method around the world. It uses the waste of one industry as alternative sources of energy or minerals (i.e., alternative raw materials) for the production process of another industry. While disposing of waste in a safe manner, it reduces the need for fossil fuels and natural resources for manufacturing. Crushed glass can be used as road aggregate and even computer monitors are used like this.

Co-processing is applicable to many industries, such as steel, lime, cement, ceramics, bricks and glass. For example, take cement industry, which is among the leading co-processing industries.

In cement co-processing, two processes are carried out at the same time. The primary process is cement making and the secondary

process is industrial waste destruction. The nature of the cement making process, especially the conditions in the cement kilns, makes cement kilns highly suitable for effective destruction of industrial waste. These conditions are the extreme temperature inside the cement kiln (averaging 1450°C), relatively high residence time of gases, excess oxygen for complete combustion and high air turbulence for required for mixing. Together, these conditions ensure total destruction of industrial waste, including hazardous waste.

Option 6: dispose of waste

If waste cannot be made useful through an option such as reuse, recycling or recovery, then the only option left is final disposal in a safe manner, minimizing any adverse effect on people and the environment. Two widely adopted methods of final disposal are incineration and sanitary land filling.

An incinerator is a furnace for burning waste under controlled conditions. Incineration produces acid gases, carbon dioxide and toxic chemicals that must be treated with air pollution control equipment to prevent their contribution to acid rain and air pollution. Ashes resulting from incineration should however be disposed of, either at a landfill or, if toxic, at a hazardous waste facility. High moisture content and low calorific value of the municipal wastes generated in Sri Lanka make their incineration uneconomical and impractical. Although incineration looks similar to co-processing, incineration consumes energy while co-processing recovers energy. Moreover, incineration results in either gases or ash, which should be treated again, whereas co-processing achieves complete destruction. However, waste-to-energy (WTE) plants are those that carry out incineration with energy recovery as popularly used in Singapore. The residual ash is used in reclaiming land!

A sanitary landfill is a site designed for the final disposal of waste in a safe and environmentally sound manner. A landfill is a hole in the ground, where waste is dumped in layers alternately covering them with soil layers. A sanitary landfill site is equipped with methods to minimize adverse effects associated with solid waste disposal: containment of leachate and gas, daily cover for the working surface, and run-off and run-on diversions to counter surface and groundwater pollution. Moreover, it is aesthetically more acceptable than an open dumpsite. A poorly

managed landfill or an open dumpsite pollutes ground and surface water and allows the generation of waste gases, such as carbon dioxide and methane. One ton of biodegradable waste produces 200 to 400 m³ of landfill gas, mainly methane. However, by creating landfills, we simply bury and lose our resources rich in energy and materials. Therefore, in Britain, waste going to landfill is now taxed to generate funding for alternative waste management, which are environmentally sounder and economically more rewarding in the long run.

Although land filling is mentioned as a disposal method, it is disposal by way of storage of waste. Since it stores waste, it is not an environmentally sound method, especially if land filling is done in an unsanitary manner.

We all have a role to play

Population continues to grow. With the development of modern technologies, lifestyles will become even more modern and fashionable, requiring more products and services and consequently generating more waste. Development of urban growth centers will worsen the crisis even further. Without delay, therefore, the country needs an integrated solution to this waste crisis.

The basis to a lasting solution to the waste crisis is the waste management hierarchy, comprising – in the order of desirability – avoid, reduce, reuse, recycle, recover and dispose of. And as individuals, we all have a role to play in putting these options into practice. In this regard, sustainable consumption is the way forward.

In avoiding or reducing waste, which are the most preferred options, it is we as individuals who wield the power. For example, that we reuse the bag of our lunch packet has little to do with the authorities. We can say no to products with heavy packaging. Although we

cannot recycle waste at home, we can encourage recycling by purchasing recycled or recyclable products. Moreover, for recycling and co-processing waste, material collection at the source should be classified. So without simply throwing away waste into one bin, we may have to collect organic waste, plastics, glass, metal, paper separately. Therefore, although the actual process of recycling or co-processing takes place in the industry, we will have a decisive role to play from home and our workplace.

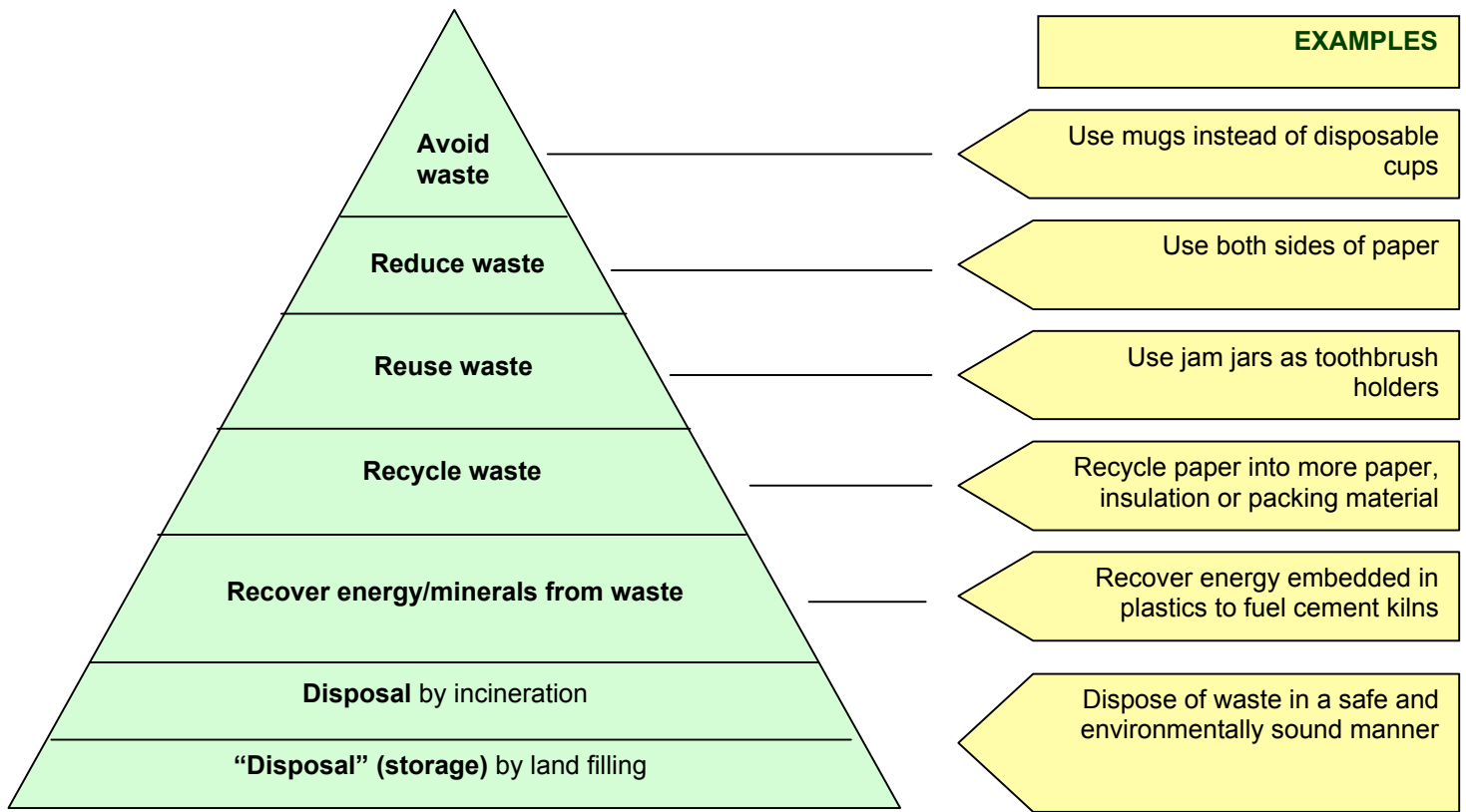
So, we should cooperate with the authorities to find a lasting solution to the waste crisis. After all, it's our waste – the waste you and I produce – that has caused this mess. It's our responsibility to lend a helping hand. What is mainly asked from us is source separation, i.e., separation of waste at origin (e.g., separate organic waste from recyclables). This is possible when we are aware of the types of waste and possibilities.

And let's not forget that solving this crisis through intelligent waste management will positively contribute to the country's economic performance, reduce adverse effects on the environment and enhance our quality of life.

We can easily state that "Waste is wealth". However, wealth does not come from just collecting waste and nobody really follows that option. Wealth realization is through proper waste management. This again emphasizes the need for proper understanding of waste. People usually ignore waste thus depriving themselves thus depriving themselves the required process of "understanding". This will lead to the dictum – Do not WASTE waste!

Professor Ajith de Alwis
ajith@cheng.mrt.ac.lk

Asitha Jayawardena
writer_asitha@yahoo.com
asitha3@hotmail.co.uk



In the waste management hierarchy, the best option is "Avoid waste". As you go down, the preference lowers and the least preferred is "Disposal of waste"

Waste Management Hierarchy