

WASTE?



An approach paper for sustainable management of waste

Suchitwa Mission

Local Self Government Department, Government of Kerala

(English)

Waste ?

By

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Thiruvananthapuram
Date 10.08.2015

Dr. M. K. Muneer

Minister For Panchayats &
Social Justice, Kerala



The Suchitwa Mission has been taking enormous efforts and variety of initiatives to achieve its vision “Waste Free Kerala with unpolluted environment”. The state is really in need of a clear-cut comprehensive strategy and approach in Waste Management. Fulfillment of its vision requires public awareness and public support.

I hope this book will definitely give insight to all stakeholders and bring momentum to State’s endeavours towards its goal and will be a very useful guide for the Local Self Government Institutions in Kerala.

Let us together strive for the realization of our dream of a ‘Clean Kerala’!

Good wishes!

Sincerely

Dr. M. K. Muneer

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Sri. A.P.M. Mohammed Hanish IAS

Secretary (Urban)
Local Self Government Department
Government of Kerala



Kerala has been carrying out multiple initiatives to address the challenging issue of managing waste. I am happy to note that Suchitwa Mission has come up with a strategy and approach to manage the issue environment and people friendly.”

The book ‘Waste?’ will really give an insight to all the concerned stakeholders, particularly the LSGIs, to develop a strategy for them in this sector.

I wish them the best in their endeavours.

Sincerely

A handwritten signature in blue ink, appearing to read 'A.P.M. Hanish'.

A.P.M. Mohammed Hanish IAS

FOREWORD



Books or monographs on waste treatment are not exactly rare. People are always coming up with cynical observations and erudite suggestions about waste treatment, one of the most trying problems of modern era.

Public minded citizens and erstwhile bureaucrats abound among them. However, a book written by a senior bureaucrat, heading a government sponsored Shuchitva Mission is something new. But what is most refreshing about this book is that it appears not at all like one prepared by a bureaucrat. At times it more or less echoes the voices of civil activists, but in general it does reflect the practicality and reasonableness of official missions. The welcome aspect is that it does not reflect the oft seen fad for high tech magic solutions which high officials usually prefer and advocate as a panacea. The book reveals a keen understanding of the ground reality as well as the state of the art of technological solutions. Above all, it is spiced with a welcome sense of humour, so rare in official publications.

The book appreciates the special situation in Kerala, the peculiar composition of its urban wastes and recognizes that composting is the most appropriate procedure for treating it. It also recognizes the practical problems with composting, in so densely populated a state, and the set backs from ill managed early attempts. Naturally, it does not recommend a one-track solution, but suggests a set of remedies, starting with the proverbial "Three Rs". Not surprisingly, it emphasizes the role of the public, while not neglecting the role of the LSG bodies in tackling this grave problem. Most unexpectedly, it also points to the philosophical aspect of waste creation, which is becoming an inevitable part of modern civilization. So, in addition to the "Three Rs", it also adds a fourth: "Refuse" - to limit our consumption, an aspect not normally dealt with in western publications.

The fact that Shuchithva Mission, the official Agency to keep Kerala clean, is coming up with such an insightful manual, promises that the State Departments and Agencies will extend an enlightened guidance in creating a "Clean Kerala."

R V G Menon

FOREWORD



Waste to wealth and not to waste. How will Indian cities manage the growing volumes of solid waste? It is clear that with each coming year, while the quantum of waste that is being generated is increasing, our capacity to collect, transport, dispose and reuse garbage is going down. As a result, cities are drowning in piles of refuse. This, in turn, is adding to public health challenges. It is for this reason the country needs to find approaches and models of waste management that are affordable and sustainable.

Kerala has done important work in this direction. It has taken leadership to set up the dedicated state level mission for total sanitation and a clean environment. The Suchitwa Mission was set up in 2008 and plays a critical role in determining the way the state should proceed to manage its waste. It is clear that the work in Kerala will have important lessons for the rest of India. Kerala, because of its high population density, high rates of literacy and growing environmental awareness has the right conditions for change. In the current situation, people are saying – rightly – that they do not have the waste of someone else in their backyard. This not-in-my-backyard (NIMBY) syndrome is creating challenges for waste management. But what is important and interesting is that the state is open to look for new, innovative and path-breaking changes in the way waste is managed in our country.

The work in Kerala to look for alternative models of waste management, which require people to segregate waste at the household level and as far as possible manage it locally, are models for the entire country. They teach us that unless we can learn the art and science of segregation of waste – at source – waste management strategies will be expensive and indeed futile. This is also the lesson from other parts of the country, where waste-to-energy plants are failing because of the lack of segregation. It is also clear that if segregation is not done, then the waste-to-energy plant will require stringent standards for pollution control, so much so, that this makes the plant financially unviable. In this situation, segregation at source becomes the imperative of successful solid waste management strategies.

This is where Kerala is taking the lead. The model of waste management, which incentivizes segregation at source and then looks that affordable and appropriate technologies for compost and reuse is the only way ahead for India. We need to look at waste as a resource – not to throw away in landfill sites – but to use to recycle and reuse. This also means that the role of the informal sector is crucial in the business of waste management. India has a rich tradition of recycling. It also has a vibrant (yet hidden and unrecognised) informal recycling industry. The objective has to be to optimise on the strengths of this industry and not to replace it. I believe the lessons from Kerala will be crucial for the entire country. We desperately need solutions to our garbage problem. The answer, as the Kerala waste management model shows is, to turn the garbage into wealth and not to waste.

Sunita Narain

FOREWORD



Dear Reader,

This book will not only change your personal attitude towards your own waste management performance but will also help you to contribute to your civil society as a whole in a very positive manner. You will be confronted not only with “lessons learnt” but also with “lessons unlearned”, waving good bye to a lot of misconceptions in a very light and enjoyable way. By translating complex technical and economical processes into common sense it makes very much clear, that the solution lies in all of us.

When we joined the Indo German Environment Partnership Programme in 2008, which amongst others supported SWM in Kerala we first had to learn that issues regarding waste management in urban India are far more than choosing the right technology. Though proper technologies are important, the success of MSWM is all about common people, good processes, accountability and institutions, which take up the challenge and which are capable to step wise develop own local solutions.

This book carves out a road map for municipal solid waste management specifically for Kerala. I must congratulate Suchitwa Mission for spelling out such a clear local vision for SWM for the state as a whole by clearly indicating everybody’s responsibility in the system. It also clearly shows, that we cannot hope for a machine like technology, which solves all the problems of SWM.

The solutions suggested for Kerala are sustainable, cost effective and – if planned well – socially inclusive. They cover scientific issues as well as often forgotten issues of financial sustainability. Unless a SWM system is not affordable to everybody and unless it does not provide livelihoods and dignity to the workers involved, it will not sustain. Suchitwa Mission, after studying various national and international models in-depth has had the courage to take an informed decision and to lead Kerala into an environment friendly SWM system. To take such a clear position deserves all our respect and we are sure, following this line will bring success for SWM to Kerala.

We thoroughly enjoyed reading this book and wish Suchitwa Mission all the best in its endeavour to improve SWM in Kerala.

Dr. Regina Dube
*Former Project Director
of GIZ India*

Dirk Walther
*Project Director
of GIZ India*

FOREWORD

This book is an approach paper aimed at giving a strategy, that Suchitwa Mission, the state nodal agency for sanitation would like to advocate to the local bodies. But this document has moved away from conventional documentation techniques. This was an intentional one, as Solid Waste Management (SWM) could be one of the most challenging, sometimes even frustrating feat, for those who have the responsibility to ensure sanitation. Many even feel that we just do not have a solution in hand.

The mission strongly feels that this feeling is mainly because of three main reasons:

1. Lack of in depth knowledge on SWM.
2. Misconceptions on the subject.
3. A tendency to produce quick results, resulting in ad hoc projects thereby bypassing integrated and comprehensive planning.

This conclusion is arrived at after a series of consultations held through workshops and field work that the mission carried out. Therefore it is strongly felt that if results have to come through implementation agencies, namely local bodies and others, what is required is a mind change management, a fresh relook and a deep rethink. So apart from the aim of rolling out a strategy for the state, this book is aimed at shaping the idea of the reader towards Sustainable Management of Resources rather than Waste Management per se.

Hence, obviously this could not be a conventional document as what is required is an unconventional approach towards this challenge.

The document goes more like a thought process that happens within a human mind, asking questions, allowing one to think, rethink, to unlearn misconceptions (all with an element of fun and pun) and finally convince that though the problem is complicated solution is simple if this strategy is adopted. The strategy and the messages contained are highly customised for Kerala scenario. Since the document goes highly analytical and a bit elaborate it is presented in a very informal manner with a maximum effort to prevent the reader from closing the book out of boredom and instead make the experience of reading this book an enjoyable one. This is not a technical document and hence will not deal with technical details of each and every component discussed. This is not meant for just government officials and policy makers. It is meant for every person from all walks of life, as the mission feels that the information contained in this document is something every responsible citizen should know. Therefore this is something the mission expects even school children to read and understand.

The mission hopes that this document will answer all basic questions related to waste management.

AUTHOR'S NOTE

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Dr. K. Vasuki IAS

Executive Director, Suchitwa Mission

ACKNOWLEDGEMENTS

This document is a printed version of the collective wisdom of some of the greatest minds. Sri RVG Menon (retd Professor of College of Engineering and Technology, Trivandrum) who is beyond any descriptive words, has always given the right kind of direction for the mission and the book is an effort to give a concrete shape to all the guidance received from him right from the beginning of the mission.

Mr. Shibu K Nair, Thanal whose immense field experience and experiments and expertise in waste management is reflected all through the book. His vision on a Zero Waste Society has illuminated the entire document.

Dr.C.N.Manoj, scientist, environmentalist and MD Pelican foundation has created a philosophical doctrine in waste management and environment and entire spirit of the book is gained from this philosophy.

Dr. Ajay Kumar Verma the first Executive Director of the mission, for his immense contribution in showing the right direction to the mission in its formative years.

Dr. Regina Dube, ex Project Head GIZ, whom I have constantly pestered with questions for every detail on the experience of her country, Germany and her patient “mentoring” in return has contributed immensely in developing the confidence to conclude that this strategy is the only way forward for this state if not for the country. Moreover the book takes many references from the draft Manual on Municipal Solid Waste Management which is prepared by the GIZ team headed by her.

Mr.Dirk Walter, Project Head, GIZ whose deep understanding of the Indian ethos and commitment towards this country has allowed me to compare, analyse and understand the phases a country goes through. Interactions with him gives me the confidence that this country will yet again show the world some of the greatest models in waste management.

All that can be said in conclusion is that only the words are mine, thoughts are all theirs (with some exceptions may be!)

Above all the unconditional support and freedom to work given by my Secretary Sri Haneesh Mohammed IAS, Principal Secretary Sri. James Varghese IAS and the Chief Secretary Sri. Jiji Thomson IAS goes a long way in giving a final shape to this book.

Last but not the least the former Chief Secretary Sri. Bharat Bhushan IAS Retd., but for whom I would not have been posted in this mission and this book could have never been a possibility.

CHAPTER 1

WHY TO MANAGE WASTE ?



Why do we have to manage waste in a scientific manner in the first place?

Can't we just burn them or just dump them?

Why should I as an individual be bothered at all ?

The one line answer for this would be

“Waste management is a Medical Emergency”

Just like, how a Doctor is expected to act in an Emergency Room to save a patient, we all should pull our acts together to save ourselves, especially our children.

“

Waste management is a Medical Emergency

”

WHO

A quarter of the diseases is due to environmental pollution

22 diseases are caused due to poor waste management alone.

In one of the consultations the mission encountered a very interesting argument. One of the participants claimed that his household is a Zero Waste household. We asked him how. He said he composts his kitchen waste. We appreciated him for his efforts in home composting and affirmed that it is the right thing to do. And then we asked him what he does with the rest of his Non Bio-Degradable Waste (the part of waste that is not easily biodegradable otherwise called “dry” waste which includes paper, plastic, metals, glass and e waste). He answered proudly that he has very minimal of it and whatever little he ends up, with he burns them regularly without fail.

Here is another interesting story, or rather a story that should not be called that way. In one of the field visits by our volunteers, they asked a man what he does with batteries and other e-waste. He proudly said that he puts them for the banana trees as they completely prevent any pests coming to the trees and therefore he has been self sufficient in bananas for the past twenty years. The volunteers in an effort to educate him asked him not to continue this practice, as that can cause cancer. His face changed immediately. The volunteers learnt that his wife is undergoing treatment for cancer.

Many even ask this “We have been burning garbage traditionally So what is the big deal now? Will it not just go up and disperse or disappear?”

The above stories and many more field experience has made the mission strongly disbelieve the myth, that the people of Kerala are well aware of the ill effects of improper disposal of waste.

So, this chapter is dedicated entirely to prove the point why waste management is a medical requirement rather than anything else.

What is wrong with what the men in the two stories did?

What is wrong in burning?

What is wrong in just throwing away our waste?

Even developed nations went through this phase. They were either burning their waste in their backyard, or dumping them in huge dump-sites. It is only when, health effects became evident through one or two cases, extensive research went into the health hazards caused due to improper disposal of waste and the need for scientific disposal came to be realized. The following facts are the results of such extensive studies, compiled and given.

Why shouldn't we burn ?

Because what goes up has to come down. Just like newton's apple.



But what comes down from burning is not as sweet as an apple. They are the most toxic chemicals produced.

“

Even developed nations went through this phase. They were either burning their waste in their backyard, or dumping them in huge dumpsites. It is only when, health effects became evident through one or two cases, extensive research went into the health hazards caused due to improper disposal of waste and the need for scientific disposal came to be realized.

”

Source: United States Environment Protection Agency and others.

Burning trash in the open produces many pollutants, including:

- Dioxins and Furans,
- Particle pollution,
- Nitrogen oxides
- Sulphur oxides
- Hydrochloric acid
- Polycyclic aromatic hydrocarbons,
- Volatile organic compounds,
- Carbon Monoxide,
- Hexachlorobenzene, and
- ash.... which can contain toxic metals such as mercury, lead, chromium, and arsenic.

Many dangerous health conditions can be caused by inhaling or ingesting even small amounts of these pollutants. **Small children, the elderly, or people with pre-existing respiratory conditions can be especially vulnerable to some of these pollutants.**

Backyard burning is of particular health concern because it produces significant quantities of dioxins and furans.....Currently, however, the largest quantified source of their emissions is the uncontrolled burning of household trash (backyard burning). **Studies have shown that only small amounts of chlorinated materials in waste are required to support dioxin formation when burning waste.**

This means that even when materials containing high levels of chlorine, such as PVC, are removed from household trash, burning the waste still creates dioxins because nearly all household waste contains trace amounts of chlorine.



Much of the dioxins and furans created and released into the air through backyard burning settle on plants. These plants are, in turn, eaten by meat and dairy

animals, which store the chemicals in their fatty tissue. People are exposed to dioxins primarily by eating meat, fish, dairy products. Plant based foods and direct inhalation are also other routes of exposure. Backyard burning occurs most commonly in rural farming areas where dioxin emissions can more easily be deposited on food crops and grazing lands. These dioxins then accumulate in the fats of dairy cows, beef, poultry, and swine, making human consumption of these harmful chemicals difficult to avoid.

Dioxins and Furans are classified as Persistent Organic Pollutants (POPs). *Source: Stockholm Convention:*

Persistent Organic Pollutants (POPs) are organic chemical substances, that is, they are carbon-based. They possess a particular combination of physical and chemical properties such that, once released into the environment, they: remain intact for exceptionally long periods of time (many years); become widely distributed throughout the environment as a result of natural processes involving soil, water and, most notably, air; accumulate in the fatty tissue of living organisms including humans, and are found at higher concentrations at higher levels in the food chain; (bio accumulative) and are toxic to both humans and wildlife.

“

The Stockholm convention mandates the parties to the convention (India is a signatory of the convention) to eliminate the sources and production of dioxins and furans.

”



It is for the above reasons the Stockholm convention mandates the parties to the convention (India is a signatory of the convention) to eliminate the sources and production of these chemicals.

Dioxins can alter the fundamental growth and development of cells in ways that have the potential to lead to many kinds of impacts. These include adverse effects upon reproduction and development, suppression of the immune system, disruption of hormonal systems, and cancer.

Diseases caused due to Dioxins and furans:

1. Cancer
2. Skin disorders, such as Chloracne
3. Liver problems
4. Impairment of the immune system,
5. Impairment of the endocrine system
 - a. Decrease in testosterone
 - b. An increased risk of diabetes
6. Reproductive functions including
 - a. Infertility.
 - b. Endometriosis.
 - c. Reduced sperm count.
7. Effects on the developing nervous system and other developmental events thereby affecting children mainly leading to
 - a. Birth defects when pregnant women are exposed
 - b. Developmental delays.
8. Trans-generational effects which passes on the ill effects to generations.

Other pollutants mentioned in the list cause the following ill effects:

1. Asthma
2. Bronchitis
3. Cardiac arrhythmias
4. Heart attacks
5. Damage to liver,kidney and Central Nervous System (CNS)

OF PARTICULAR MENTION IS ASH....

Ash

Backyard burning also produces ash residue, which can contain toxic metals such as mercury, lead, chromium, and arsenic. These metals can be toxic when ingested. When a person ingests hazardous amounts of lead, for example, he or she may experience high blood pressure, cardiovascular problems, kidney damage, and brain damage. (Which is why use of lead in products is banned in

many countries). Arsenic is carcinogenic especially in children. Unaware of the potential danger, some people scatter the ash in their gardens or bury it on their property. Garden vegetables can absorb and accumulate these metals, which can make them dangerous to eat. Children playing in the yard or garden can incidentally ingest soil containing these metals. Also, rain can wash the ash into groundwater and surface water, contaminating drinking water and food.

So, The rich tradition and the most widespread practice of burning that the people of Kerala are now merrily doing in every house and every corner of the street is nothing less than consuming a slow but very toxic poison. People of Kerala are at a higher risk for dioxin and furan due to high consumption of fish and meat as they tend to accumulate in them as mentioned earlier .Even the myth that ash obtained after burning waste is a great manure is broken by the above facts.

Any burning....burning anything is bad.

Think of this planet or your immediate environment as a room with a capacity of 10 people. As long as 10 people fit in the room everybody is comfortable. Imagine you fit 100 in the same room. Result ...suffocation.

Why?

Because, every system has a capacity to assimilate. The more man made burning you do, the more you suffocate the assimilating capacity of your immediate environment. Hence we even discourage open burning our dead ones, though it has been our tradition.

If all the above data is too much to remember let us **Drive home one point and remember two chemicals.**

Point

Never burn anything.

Two chemicals

Dioxins and Furans ... two of the most toxic chemicals known to science.

Let them be remembered every time we burn.

“

People of Kerala could be at a higher risk for dioxin and furan due to high consumption of fish.

”

So

Burning is bad... let us just dump them Shall we ?

What happens typically in a dump site big or small:

Kerala is one of the most modern and consumerist society in our country. If you open a plastic bag that contains the remains of this consumerism, thrown stealthily early in the morning or late in the night by your neighbour (or you?!!) You will find not only the kitchen waste but also innumerable items including broken plastic toys, sanitary pads wrapped in newspaper, liquor bottles from the previous party night, packaging materials including Styrofoam and thermo-coal packages with food remnants, electronic waste including batteries, flourescent tubes, etc, etc, etc.

Do you know how many chemicals go inside each and every one of these products? Each of the product we use contains many toxic chemicals. One example, is the newsprint in newspapers which is loaded with lead, the no:1 enemy for children. Another example would be the mercury in flourescent tubes (including tube lights, CFL lamps etc.) which is one of the most potent carcinogens. Take any item, even the cloth you wear is loaded with chemicals.

There is a classification between hazardous waste and MSW (Municipal Solid Waste) or household waste. But it is proven by recent research (Texas Water Research Institute) that the dump-sites of MSW are as toxic as those of Hazardous waste. **But it is proven by recent research (Texas Water Research Institute) that the dump-sites of MSW are as toxic as those of Hazardous waste.**

One of the best models that Kerala has presented to the world, for which Kerala is looked upon by the entire world is decentralisation. It appears that our dump-sites have also faithfully followed this decentralisation path. Unlike in other states or countries where you find one huge mountain of dump, one can find such dumpsites in every street and every vacant plot . Many of such dumpsites will also be close to some form of a water body, either a small pond or a drainage

channel or their ilk. Many think that once they wrap up all their waste and get it out of their house they can forget about the waste. May you be warned that your waste is like a faithful dog and no matter where you leave it, it will follow you back. It is like that old famous ad in which the cute little dog follows you around.

Remember waste also has a huge network and it will follow you no matter where you dump it.



So what happens when you dump waste?

Whenever mixed waste containing multiple streams of waste is dumped in one place, the organic and inorganic content of the waste interact chemically and give rise to what is called

“Leachate”

Leachate from purely organic waste cannot be toxic. But leachate contaminated with Non Bio Degradable Waste, (apart from having high BOD (Biological Oxygen Demand), COD (Chemical Oxygen Demand), TOC (Total Organic Content) and high levels of nitrates, sulphates, etc and thereby loaded with pathogens,) it contains some of the most toxic chemicals mainly heavy metals, that are mentioned in the list, that follow after this paragraph. When this leachate (loaded with such toxic chemicals and heavy metals) reaches the soil and water, they enter the plants, animals eat these plants; ingestion of plant- and animal-based foods thereby become the largest sources of toxic heavy metals in humans. Now you know how the network of waste follows you around.

Lead, Mercury, Arsenic, Cadmium are the major toxic heavy metals found in MSW. **All of them are potent carcinogens** that cause various types of cancer including lung, skin, kidney and liver cancer. Other health impairment caused by each of these metals is given below.

1. Lead: *(found in newspaper prints, coloured plastic, paints, etc)*

Particularly dangerous for children because of reduced blood brain barrier and therefore can severely affect their mental development leading to

- neurotoxicity,
- diminished intellectual capacity,
- developmental delays
- learning disabilities
- mental retardation
- encephalopathy and many more

Basically lead can deprive children of healthy physical and mental development.

It is equally toxic for adults causing

- damage to kidneys
- Reduced sperm count
- Miscarriages and premature birth in pregnant women.

“

All heavy metals are potent carcinogens

”

“

Lead can deprive children of healthy intellectual development.

”

2. Mercury: (Source: almost all electrical and lighting devices, big or small, thermometers, button batteries, etc)

Mercury, the main source being fluorescent tubes lamps is another highly carcinogenic metal. Also it a potent neurotoxin meaning, it affects the brain. Of particular nature of this heavy metal it finds way to end up in fishes mostly.



Other toxic heavy metals are

3. Arsenic (source: shampoos, toothpaste and other cosmetic products, deodorants, etc)

4. Cadmium (found in batteries)

The list of diseases heavy metal wise will be too long. Overall all these metals cause Cancer of various types. Apart from cancer the other health impairments are the following

- Genetic disease,
- Sterility,
- Abortions,
- Heart disease
- Neurological and psychological symptoms, such as tremor, changes in personality, restlessness, anxiety, sleep disturbance and depression.
- Bone marrow depression,
- Haemolysis,

“

The chemicals released affect the pillars of life namely, the reproductive system, immune system and endocrine system of any living organism.

”

- Hepatomegaly,
- Melanosis,
- Polyneuropathy and encephalopathy
- Peripheral vascular disease, which in its extreme form leads to gangrenous changes (black foot disease)

The diseases caused by improper waste disposal can be a book in itself. But let us cut it short here. The fact of the matter is dumping Solid waste is even more dangerous than industrial or vehicular pollution especially in Kerala, where industrial activity is lesser compared to other places. **Every day this toxicity is increasing mainly because of increasing consumerism, increasing share of NBDW , especially e waste which is the most toxic of the waste stream as they are loaded with heavy metals.** It is now clear why Improper Solid Waste Disposal is a medical emergency.

POINTS IN A NUTSHELL:

- Both burning and dumping are highly dangerous to health causing cancer, infertility and even genetic damage. The chemicals released affect the pillars of life namely, the reproductive system, immune system and endocrine system of any living organism. **There is every possibility that the recent increase in cancer incidence and infertility could be attributed to improper waste disposal that is highly prevalent in Kerala now,** as it is now proven that household waste is as hazardous as any other form of hazardous waste and they do cause the above diseases. This correlation is worth conducting a research on in Kerala.
- Children and developing foetuses are the most vulnerable. When they are exposed to such toxicity at a young age they develop all these diseases as they enter adulthood.
- Of peculiar interest to Kerala is that the most toxic of all these chemicals namely Dioxins, Furans and Mercury find their way mainly to fish, apart from other plants and animals. This makes the fish loving population of Kerala particularly more vulnerable to all the ill effects. Also every dump site finds entry into water source more easily than any other state once again making Kerala, the most vulnerable.

“

Since developing fetus is highly sensitive to such metals, mothers give birth to severely affected infants – Infants appear normal at birth, but psychomotor retardation, blindness, deafness, and seizures develop over time.

”

“

There is every possibility that the recent increase in cancer incidence and infertility could be attributed to improper waste disposal that is highly prevalent in Kerala now.

”

This book begins with this chapter, just to make the reader realise and wake up to the urgency that waste management requires, which most people are not aware, contrary to the popular opinion that people of Kerala are already fully aware which is evident from the stories cited early in the chapter. Now the cancer stricken wife in the second story might be a coincidence. But the causal correlation between putting batteries as a pesticide and consuming the same bananas cannot be ruled out. (No offense to anybody mentioned here).

It is only to drive home the point that we are at a precipice. Our children are facing the biggest injustice from our own selves. How much time, money and energy we invest on our children for them to have the greatest quality of life, we can possibly offer. What is the point if they do not have health because we failed to invest in environment?

You want to be a good parent, be an environmentalist. This book is a must read for all those who want to be a good and responsible parent.

Now... We can hear you say. Well I want to be a good parent but what do i do?.

Well before going there let us answer some of the basic questions. We will then say what can be done.

First and foremost.....

Empty your glass!!!

EMPTY YOUR GLASS



Just as a full glass cannot take any more water, no new information can get inside you, if your mind is full of misconceptions. In an effort to empty your thinking glass, some lessons to unlearn followed by lessons to learn in its place are given in this chapter. To begin with let us ask a very basic question.

What is waste ?



LESSON TO UNLEARN NO 1

Whether what we call waste is really waste?

The very word waste is something that has to be revisited. Because the moment it is said waste the tendency is to either burn it ,dump it or bury it and forget about it. So let us have a rethink on the very word “Waste”.

Every article that we discard today as waste must have had some utility till the previous day. **Above all the article that we discard, is a product of a series of processes which includes utilisation and depletion of limited resources of our mother earth,** expenditure of huge amounts of man hours, energy (fuel, power, etc, which is once again a limited resource on this planet) and money. To convert such a valuable product into waste in the wink of an eye and waiting to get rid of itwell, Should we?

A great mind once said **“Waste is but a design flaw”**. This is one of the most beautiful way of saying that if we have proper systems in place, there can never be waste but only resource that is not to be wasted.

It also conveys a key message that goes back to the manufacturing level. In order to ensure maximum recovery of valuable natural resources, we need to design our products and systems in such a manner that the need for disposal is ruled out. This idea will be elaborated directly and indirectly all through the book.

LESSON TO LEARN NO 1

“Waste is not a waste but is a resource that is not to be wasted”.

History of Waste Management in our country

The area of waste management in particular has had many failures in the past not just in Kerala but all over the country. Even if claims of success are made, the real success in environmental and economic sustainability is still a big question mark.



When one puts this question forward, the answer is invariably either of the following.

- There is no good technology in our country or state.
- There is no good model anywhere to emulate.

This is an easy way to discount a difficult task. But if one deeply analyses the reasons it can all be summed up in the following one sentence.

“ We have always planned for waste management in a fragmented approach and almost never in a systematic and comprehensive manner”.

To understand what is intended to be conveyed by the above sentence there are a few more lessons to be unlearned along with the lessons to be learned in its place.

LESSON TO UNLEARN NO 2

We are not able to solve our waste problem because we do not have the right technology. Let us wait for one super technology that will take care of waste like magic.



To understand what exactly is the problem with this perspective, let us dig into the dustbin inside our house. What do we find?

			
Wet Waste <ul style="list-style-type: none">• Kitchen waste• Food waste• Garden waste	Dry Waste <ul style="list-style-type: none">• Plastic• Paper• Glass• Rubber• Cloth	E-waste <ul style="list-style-type: none">• Computers• Cell Phones• Electronic devices Hazardous Waste <ul style="list-style-type: none">• Batteries• Bulbs• Paints	Bio Waste <ul style="list-style-type: none">• Diapers• Sanitary Napkins• Injection Needles• Medicines



If you see the figure, one will understand the range of products and that each product takes birth out of its own unique technology. Then ask yourself a very simple, common sense, question.

How can one technology dispose off so many products that are made out of so many technologies?

So when we “rethink” simple common sense would say that waiting for a futuristic technology to take care of all our waste, is nothing short of expecting one magic tree giving many types of fruits.

(courtesy: Ajay Padamanaban, CEO, Trivnadrum City Connect Foundation)

Our Concept of Ideal Waste Management System



So....

LESSON TO LEARN NO 2:

- There is no one futuristic technology that can take care of all our waste. Even if such a technology exists it can never be environmentally and economically sustainable.
- Above all waste is more of a cultural, behavioural and attitudinal challenge and less of a technological challenge.
- We have all the required technology right in our soil.

“

Waste is more of a cultural, behavioural and attitudinal challenge and less of a technological challenge.

”

LESSON TO UNLEARN NO 3:

If we buy the most modern machine or a plant from a vendor it will solve the problem.

Almost all of us, believe that if we buy a great product from an appealing salesman and install it in an area, they can showcase that they have found the solution for waste management. This is like expecting that, just the act of buying a pressure cooker and putting it in the kitchen, will automatically ensure hot tasty food served on table. The point is that, if we do not make the effort to do the required process of cooking (namely buy the required provisions, clean them, cut the vegetables, add water and other ingredients to the right proportion), instead of having food on the table, we will only have a mess. And this is exactly what has been happening. We invest some time to learn cooking and master the art. But we refuse to learn about something as complicated as waste management. We refuse to give time attend to the minute details of the processes involved in a comprehensive waste management system.

LESSON TO LEARN 3:

Processes are more important than the technology. The best of technology can fail if we do not spend time and energy to put necessary systems in place. The best example is the popular opinion that Composting as a technology is a failed technology in Kerala. But what lead to failure is not the technology per se , but the lack of planning for the processes required for the technology to succeed. As for instance, segregation... Segregation is like the ABC in Waste Managment language. But that never happened satisfactorily anywhere and the majority of the focus was on XYZ which is the plant (or the technology of the plant). Tomorrow another technology might come and fail and we will once again blame the technology.

Always remember, technology comes like the finishing line of a marathon race. We have an entire long stretch to run before zeroing in on technology. Unless this message is imbibed into our thinking, we can never achieve success in this sector.

Segregation is the key to an Effective Waste Management system. (Municipal Solid Waste Management manual of CPHEEO)

LESSON TO UNLEARN 4:

We are unable to manage waste because we do not have perfect systems, like those in developed nations. We should copy the systems of X,Y,Z (all possible names of developed countries) because their place looks tidier and nowhere could we see garbage, like in our country.

This lesson to unlearn needs a very deep analysis.

If one studies the history of waste management across the world every country, mainly the developed countries would have gone through almost the same following phases.

1. A very early phase (medieval and earlier times), where the concept of waste was virtually nonexistent. The little biodegradable waste generated in the form of kitchen waste, was used as manure for agriculture and as cattle feed for farm animals. A very small non biodegradable component (it cannot be even called waste) mainly in the form of metals was completely reused and recycled, as the manufacturing capacity of humanity to keep mining and producing virgin products was very minimal at those times.
2. A budding industrial phase (the industrial revolution phase) where production increased, but still not to the level that they could afford to wastefully dump the used items and **there was an economic necessity, which ensured recycling.**
3. A boom in manufacturing sector and consumerism (the beginning of globalisation) which led to mindless generation of waste. **The economic need for recycling reduced, “use and throw” culture became rampant, used items were**

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Barring a very few developed nations, it will be very difficult to find a completely foolproof system of Waste Management, that prioritises environmental sustainability, anywhere in the world.

”

considered waste, which lead to unscientific dumping.

4. Countries realised the harmful effects of dumping, and started doing scientific landfilling.
5. Countries realised that they could not find vast stretches of land to continue landfilling and then introduced policies for incineration and there was a huge drive for incinerators. Both dumping and incineration were essentially based on the approach of disposing the waste rather than recovering resources.
6. It is only in recent times, the same countries, are coming back to traditional methods of composting and recycling, as the **world realised that environmental sustainability through resource recovery is a necessity**. Therefore they now frame policies and plan towards systems that essentially focus on **resource recovery for environmental sustainability, rather than disposal**.

It will not be untrue when we say barring a very few developed nations, it will be very difficult to find a completely foolproof system of Waste Management, that prioritises environmental sustainability, anywhere in the world.

Guess where the following pictures were taken ?

Keep thinking you will find the answer in the coming thoughts.....



LESSON IN NUTSHELL

The concept of recovery of resource from waste for the purpose of sustainable management of resources is emerging as a mature strategy to cope with the ever-growing complexities of handling large volumes of solid waste. . India or for that matter Kerala is a green field as for as waste management goes. Hence whatever we plan, the planning should be having this philosophy in mind.

The picture on the left is taken in Newport, Wales in 2014 and the one on the right is a dumpsite in Alaska, USA. This is not meant to demean any country. This is just to drive home the point that even developed nations do not have a fool proof system for waste management and disposal, though their streets and cities look spic and span and they have an amazing garbage collection system. Therefore we cannot keep searching for a perfect system around the world, so that we can emulate it in our country.

Our country is the most unique country with a unique culture, unique economy and above all unique problems more so for Kerala. Yes, definitely we can learn a lot from their systems, but we cannot imitate their systems.

LESSON TO LEARN 4

Waste management is still like an infant taking baby steps all over the world. It is still evolving to maturity and even developed nations are still debating, learning, revisiting and revising their strategies.

So do not look for a foreign solution for an Indian problem or even an Indian solution for Kerala problem. Systems have to be customised as per local requirements and strengths. For all you know, Kerala has all the potential to show the world how to manage waste.

LESSON TO UNLEARN 5

Waste is government's responsibility and governments' responsibility alone:

Though this point is coming at the last, this is the main "rethink" that is needed. This is put as the last point for a reason.

As has become clear from the above arguments, we do not have a fool proof system anywhere. The main reason is because of this idea, that waste is government's and

“

Waste management is still like an infant taking baby steps all over the world. It is still evolving to maturity and even developed nations are still debating, learning, revisiting and revising their strategies.

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The main point that climate change experts and environmentalists have been trying to hammer again and again, is that unless we bring about “lifestyle changes”, our planet earth will give up on us.

”

government’s responsibility alone and it should be the government that should manage all our waste. This thinking is akin to the thinking that prevailed in government at the item of “License Raj”. The government will do everything starting from producing, manufacturing and all that there is to it. Slowly we rethought and realized that government instead of trying to do everything, should focus more on regulating and facilitating , so that citizens are enabled to contribute in the best way possible to the economy. So much rethinking has what has led us to now prioritize “Ease of doing business”

Well, the “ease of managing waste” multiplies several fold when the same approach is taken in waste management.

Point of the matter, is every one of us should take equal responsibility instead of passing the buck to the government or the local body all the time. We are at a precipice, when it comes to environmental damage caused due to poor SWM. The main point that climate change experts and environmentalists have been trying to hammer again and again, is that unless we bring about “lifestyle changes”, our planet earth will give up on us.

Responsible waste management practices is the lifestyle change that all of us have to adopt if we are aiming to pass down a healthy planet to our children. Yes, government has a crucial role in regulating and facilitating in putting up good systems in place. But the part that has to be played by the citizen has to be expanded, because we just do not have any other option for ensuring sustainability. Unless this message is loud and clear nothing can move forward in SWM.

What is meant by responsible waste management practices is dealt with detail all through this entire document which will once again be summarised at the end of the document.

LESSON TO LEARN 5

The problem of waste is complicated but the solution is not. The solution is simple when each and every one of us decides to take up the responsibility.



For recapitulating and remembering let us remember the following six Ps while planning for waste management.

- **Posterity** (always think of a system that will ensure passing down a healthy environment for the future generations to come)
- **Processes** (*are more important than technology*)
- **Planning** (*needs to be meticulous giving attention to details*)
- **People' responsibility** (*should be equally given importance and above all....*)
- **Patience &**
- **Perseverance**

Having had our minds rinsed and cleansed,

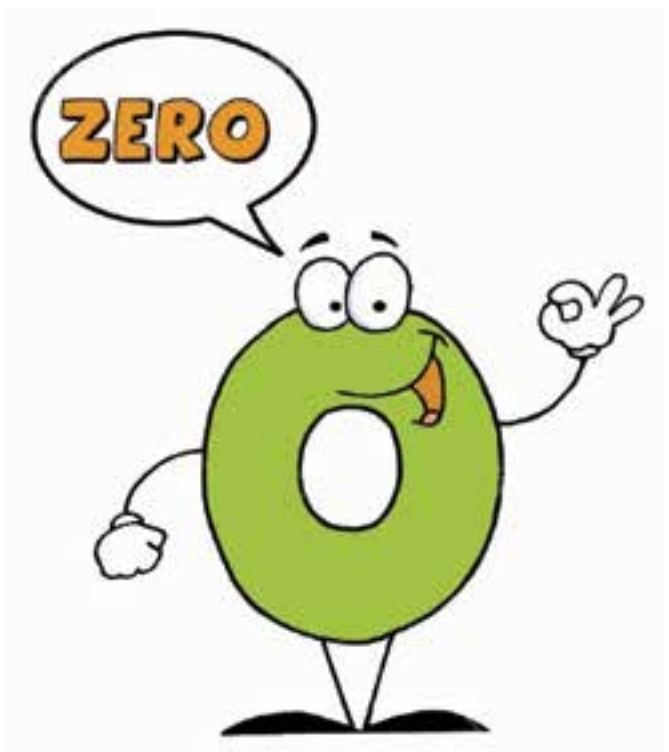


“

We are at a precipice, when it comes to environmental damage caused due to poor SWM. Every one of us should take equal responsibility instead of passing the buck to the government or the local body all the time and the part that has to be played by the citizen has to be expanded because we just do not have any other option for ensuring sustainability. Unless this message is loud and clear nothing can move forward in SWM.

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ZERO WASTE



Be it Waist or Waste,
Zero is the Best

The previous chapters would have now clearly conveyed that life cannot continue the way we are living right now. We can no longer continue to be voracious consumers and mindless waste generators and waste dumpers.

Before going any further let us look at the theme of the World Environment Day 2015 of United Nations Environment Programme. It has to be read at least thrice to assimilate what is being conveyed.

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Waste is actually valuable resource taken after bleeding our mother earth. So we just cannot afford to go for technologies that encourage disposal or disappearance of waste. We need to put in systems that ensures maximum recovery of resources and their reuse.

”

Seven Billion Dreams. One Planet. Consume with Care.

The well-being of humanity, the environment, and the functioning of the economy, ultimately depend upon the responsible management of the planet's natural resources. Evidence is building that people are consuming far more natural resources than what the planet can sustainably provide.

Many of the Earth's ecosystems are nearing critical tipping points of depletion or irreversible change, pushed by high population growth and economic development. By 2050, if current consumption and production patterns remain the same and with a rising population expected to reach 9.6 billion, we will need three planets to sustain our ways of living and consumption.

The WED theme this year is therefore "Seven Billion Dreams. One Planet. Consume with Care." Living within planetary boundaries is the most promising strategy for ensuring a healthy future. Human prosperity need not cost the earth. Living sustainably is about doing more and better with less. It is about knowing that rising rates of natural resource use and the environmental impacts that occur are not a necessary by-product of economic growth.

What is very relevant for waste management from the above message is that we can no longer waste our waste. Waste is actually valuable resource taken after bleeding our mother earth. So we just cannot afford to go for technologies that encourage disposal or disappearance of waste. We need to put in systems that ensures maximum recovery of resources and their reuse.

Wanting to dispose waste as if it is unwanted is equivalent to disposing off the life giving blood of our mother earth. There will be no life left on this planet if both were to happen.

Hence this strategy will only go for systems that

1. Ensures **maximum recovery of resources** through recycling and reuse.
2. Gives maximum emphasis to **behavioural and lifestyle change** to be brought about by each and every one of us to achieve the above.
3. Ensures not only **environmental sustainability but also economic sustainability** as Kerala or for that matter any country cannot keep on spending money to not just produce unwanted waste but also spend even more to dispose them.

It is with the above objectives in mind that the mission is adopting and advocating Zero Waste as a strategy and goal not just as a policy but as a life's endeavour for each and every one of us.

This is relatively a new concept that is gaining momentum in many environmentally conscious countries including Australia, Canada, etc. Even those countries who had a phase of landfilling and incineration are turning back to sustainable systems like composting and recycling. The internationally accepted definition of Zero Waste is as follows.

Zero Waste is a goal that is ethical, economical, efficient and visionary, to guide people in changing their lifestyles and practices to emulate sustainable natural cycles, where all discarded materials are designed to become resources for others to use.

Zero Waste means designing and managing products and processes to systematically avoid and eliminate the volume and toxicity of waste and materials, conserve and recover all resources, and not burn or bury them.

Implementing Zero Waste will eliminate all discharges to land, water or air that are a threat to planetary, human, animal or plant health

Now

Some of you reading the above might be already thinking that this is too idealistic and not practical. This book is an effort to actually convince that bringing in such systems, is actually much simpler, provided there is a will and consensus to put in such systems.

So the following chapters will go step by step into various aspects of waste management.

Various aspects of waste management:

If one sees the waste management hierarchy waste minimisation occupies the first place i.e reduction which also occupies the first position in the famous 3Rs. That brings us to the part to explain the famous 3Rs.



THE 1ST R REDUCE



Source: MSW Manual

Waste minimization results in reducing the amount and/or toxicity of the wastes produced. Minimization is the most preferred waste management strategy in the the ISWM (Integrated Solid Waste Management) hierarchy as it reduces the quantity of waste to be handled, the cost associated with its handling, and its environmental impacts. In addition, the rapidly decreasing land bank in urban areas, rising costs of procuring land for processing and disposal and associated environmental impacts are all critical and significant reasons to promote waste minimization.



Just as “prevention is better than cure” for health, prevention of waste is definitely better than management of waste after its mindless generation.

Prevention usually results in the least environmental and economic life cycle costs because it requires no collection or processing of materials.

Strategies For Waste Minimization (Source: MSW Manual)

Waste minimization strategies require policy interventions at the National, State and/or local level, depending on the type of the intervention (e.g., minimizing use of packaging material, promoting use of refill containers, buy back reusable or recyclable packing material introducing national deposit system on beverage packages) and the scale at which the intervention needs to be initiated for effective implementation. Initiatives which require a behaviour change in the community need to be supported by consistent awareness programmes.

Waste Minimization Strategies Requiring A National Or State Level Directive

Extended Producer Responsibility (EPR) is a policy approach, wherein, a producer is held responsible for the post-consumer stage of a product, typically for defined tasks of separate collection (e.g. for hazardous waste components), reuse (e.g. disposal-refund systems for bottles), recycling (e.g. for used cars) and / or storage and treatment (e.g. for batteries). EPR programs are commonly made mandatory through legislation, but can also be adopted voluntarily (i.e. retail take- back programs). Extended Producer Responsibility (EPR) around key problem wastes like electronics, batteries, packaging and consumer durables (e.g. home appliances, electronics, home and office furniture) is essential for their appropriate disposal.

Typical Epr Tools

Deposit-Refund Systems (also known as beverage container deposit legislation and bottle bills): Producers charge the consumers an additional disposal fee, which is refunded upon receiving the used container. In the beverage industry, used glass bottles and aluminium cans are collected by the seller from the user and the deposit is refunded, for e.g. reusable soft drink glass bottles and large sized mineral water containers. Lead acid batteries are also taken back through the deposit-refund system, by manufacturers.

Quotas: Government authorities stipulate that a certain percentage of product content/ products/packaging material should be from recycled material. Germany has set a requirement in its previous packaging ordinance that 72% of beer and soft drink containers be refillable.

Product Bans: The threat of product bans motivates producers to phase out undesirable materials, to design for recyclability and ensure high rates of reuse or recycling. Example: In Sweden, the voluntary deposit system for aluminium cans results in achieving the government mandated recycling rate. The driver behind the deposit system is the potential for a ‘can ban’ if the rates fall below the recycling rate set by government.

Product Charges: Product charges influence the choice of materials used. An eco-tax levied on PVC in Belgium increased the cost of the product and reduced consumption of this polymer.

The above only gives a snapshot of policies that encourage waste minimisation. Best practices of waste minimisation exist all over the world. Developed nations are waking up to the fact that some of the features of consumerism need to be changed. Reducing or doing away with the “use and throw” culture, introducing and incentivising eco friendly product designs (one of the beverages company is introducing biodegradable plastic bottles to sell beverages as a pilot project) are some of the examples. This could be a separate book in itself. The mission is in the process of preparing a comprehensive material use policy and a proper framework for EPR. It is hoped that such policies make a huge difference in waste management.

Such policies can give a direction at the macro level. At the micro level, the real difference can be felt only when each and every one of us bring a change in our life style.



Unfortunately, current consumer behaviour is trending in the wrong direction. While early human society used to consume much less resources, with the dawn of the industrial area, consumerism has shown an exponential rise.

"the world has enough for everyone's need, but not for everyone's greed."

Mahatma Gandhi.

Consumerism is tightly linked to prosperity. The more stuff we have, the more prosperous we

are, the more that our peers will accept us and like us. The advertising industry makes the promise that true happiness is found in “stuff”. So we have now become rapacious consumers thoughtlessly buying and wasting things. A by-product of consumerism is the generation of waste. The more we buy, the more we throw away. Hence a little bit of simplicity in our consumerist lifestyle can make a huge difference if not for the environment but for our own children. Definitely it can make a difference in the fourth R i.e. Rupees. By means of savings.

“

First and foremost, buy and use less

”

TIPS AT AN INDIVIDUAL LEVEL:

- Shop Smart

First and foremost, buy and use less! buy only what you need and use all of what you buy.

- Second of all minimise or stop the use of disposable items such as disposable crockery (paper cups, plates, etc) non-rechargeable batteries etc.
- Bring a shopping bag while shopping instead of requesting for plastic or paper bags.



- Use a water filter to purify tap water instead of buying bottled water.

It is an unfortunate trend to see bottled water supplied in every possible place including offices, institutions, gatherings, railway and bus stations, etc. Water from purifiers based on various technologies including RO are much safer. How many

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Computerisation is one big way of reducing waste.

”

know that bottled water can have big leakages in supply chain and miscreants fill water from unsafe sources, recap it and sell it especially in India. Hence, installing water purifiers in hotels, gatherings, institutions and serving in jugs and glass made of ecofriendly material including steel will make a difference of heaven and hell in waste management.

The following picture obtained from ‘Operation Anantha’ (the cleaning up of the drains of Trivandrum City) will speak for themselves, the fall out of this disposable culture.



It is hoped that these pictures bring out the need for lifestyle and design changes in our life.

Purchase things in bulk quantities e.g. one large bag of rice instead of two small bags at two different times.

- Purchase durable items that will last you a long time e.g. rechargeable battery.
- Plan a shopping list to prevent purchasing on impulse.
- Borrow, share and/or hire things that you only need occasionally.
- Use cloth instead of paper tissue for cleaning.
- Cook and order in public places just sufficient food for meals.
- Pack breakfast or lunch in washable container instead of a one-time container.
- Avoid over-packaged goods, especially ones packed with several materials such as foil, paper, and plastic. They are difficult to recycle, plus you pay more for the package.
- At work, make two-sided copies whenever possible.
- Use computers and internet wherever possible for all personal work as well as official. E.g. paying bills, booking tickets, buying e books ,sending communications etc, through internet). Reducing paper reduces waste. Computerisation is one big way of reducing waste.

The above is just a small list that each and one every one of us can take up apart from any other means of reducing waste. There is no limit to reduce waste. Of particular importance is disposable material usage. This is a very recent phenomenon, which is another major fallout of consumerism and a culture of convenience.

THE CULTURE OF CONVENIENCE: An inconvenient truth

Today convenience is more important than anything in life. If one deeply reflects this culture of convenience has replaced all the good habits of our past. Tv and gadgets are more convenient than real people. Taking a lift is more convenient than the healthy habit of climbing stairs even if it is just two floors (sometimes even one). What really is significant for waste management is the recent attitude that using and throwing is more convenient than cleaning and maintaining, thereby there is a massive influx of disposable materials starting from drinking water in disposable paper and mineral water bottles, eating food from disposable paper plates, cups, worse Styrofoam plates and cups, etc.

Gone are the times when a family used to take a reusable water cooler for travelling. The culture of convenience has made our muscles so flabby, that they are now unable to carry their own water bottle wherever they go. They only want to buy, use and throw. All this could be great for convenience and not to forget “hygiene” but definitely not good for environment and health. Coming to the hygiene part of this disposable culture, there is no proven study saying that use of disposables has reduced the overall infection rate. Moreover, the major reasons for food poisoning happens at the stage of food preparation rather than the medium in which it is served. Common sense would say that it is only in recent times the spread of infection has increased. As a matter of fact, recent study says Kerala has 13.2% more ailment rates than the rest of the country. The major attributable factor for this increased percentage might due to increasing waste menace and **one major attributable for this increasing waste menace comes from these disposable items.**

There are two major problems that this culture poses in waste management.

1. **Volume of waste has drastically increased** in the recent years as is evident from the fact that accumulating dump sites are more in number and also in volume.

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There is no limit to reduce waste.

”

“

The major reasons for food poisoning happens at the stage of food preparation rather than the medium in which it is served.

”

2. The biggest challenge is these disposable materials causes mixed waste which can neither be composted (Biodegradable part) nor recycled (the non biodegradable part) increasing the percentage of inert in a waste stream. Currently inert forms 30% of the MSW.

As part of the campaign for integrated waste management National Games was used as a platform to convey the messages of responsible waste management. When one is done reading this success story , she/he will be convinced that life can go on just fine without disposables.



Clean and Green national Games !

A small step for sports, a big leap for humanity

Success Stories that can be emulated:

For the first time in our country an event as big as National Games was organised without the use of disposables and thereby prevented huge volumes of waste generated in the first place under the Green Protocol Initiatives of National Games. This is a proof that we can once again bring back the world without disposables and thereby prevent mindless generation of waste which damages environment.

There was a complete ban on all disposable materials, only exception being Field of Play, which also got converted during the course of the games. Water, even hot and cold beverages, were served in steel tumblers. Food was served only in reusable cutleries. **The main lesson that was learnt in this experiment was that when we completely banned the use of disposables what ended in the dust bin up was just pure food waste, which was easily composted.** The rarest and the most beautiful sight for an environmentalist was companies like Nescafe and Coca Cola serving their beverages in steel cups. Maintaining hygiene was done on the lines of the three pot cleaning system followed even in five star hotels, and there was no food poisoning or any major outbreak of infection. This broke the myth that in large gatherings disposables are needed for preventing spread of infection.

A deposit system as discussed in page was introduced with stickers costing Rs.10 was pasted on every plastic and disposable item and money was returned only on bringing the item out. This made the venues a Zero Waste and Green Zone.

All this needed an investment for extra hands, but avoided huge disposal and environmental costs. Else we would have ended with at least 100 tonnes of mixed waste which could have been only dumped. Contrary to the popular opinion implementing Green Protocol would be very expensive, **it was proved statistically that such measures actually reduced costs to a great extent.**

Hence life without disposables is not an inconvenience but an absolute necessity for a sound waste management system.

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This strategy is based on the belief that Kerala provides the best soil for a people's movement and the people of Kerala embrace any good change with open arms.

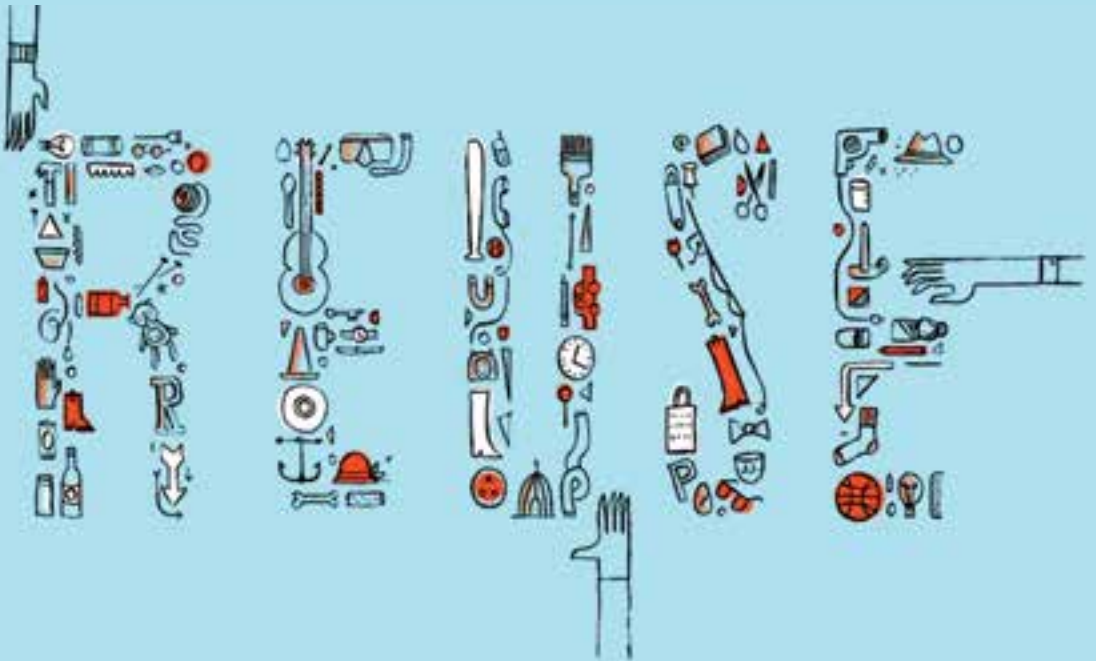
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Learnings from Green Protocol of National Games.

1. Green protocol was a success mainly because it is Kerala. The success taught us how the citizens of Kerala welcome any positive change. For example, in some of the venues, people even voluntarily washed the steel plates after having food, because of a simple step of keeping a dish washing liquid right at the hand washing area. This was something the mission never planned but happened on its own. And in some venues, looking at the zero waste concept, people even took back with them the newspaper they used to sit on, though the newspapers didn't have a sticker on them.
2. Resistance to change was witnessed highly in the first two to three days. In some places even security forces had a fight with our volunteers. But, after seeing the change they saw happening, the same people appreciated the volunteers, supported and even bonded with them ultimately leading to a great photo op with all the volunteers.
3. Moreover Standard Operating Procedure drafted for Green Protocol has enabled Green Protocol to become a movement. People realized the value in implementation of green protocol in terms and cost and pollution reduction and started observing Green Protocol in other programmes like Attukkal Pongala and other festivals , party meets, government programmes like CM's Jan Samparka Paribadi by adopting this SOP. Such programmes are now leaving minimum carbon foot print that is possible.}

The experience with the National Games has reinforced the hope of the mission that any good change is welcome with the people of Kerala and they readily embrace such change and make it part of their lifestyle. This strategy is based on this hope.

THE 2ND R REUSE



“

Recycling is very important, but even better is reusing. Recycling actually uses energy and transport time and fuel to get the items to where they need to go. If you can reuse an item yourself, that's more energy, time and fuel saved, as well as less emissions produced

”

Definition:

To reuse is to use an item again after it has been used. This includes conventional reuse where the item is used again for the same function and new-life reuse where it is used for a different function.

Recycling is very important, but even better is reusing. Recycling actually uses energy and transport time and fuel to get the items to where they need to go. If you can reuse an item yourself, that's more energy, time and fuel saved, as well as less emissions produced. From your old metal cans, plastic bags, bicycle tires, packing peanuts and computer keyboards, there are many ways to find a second life for simple items around your home by reusing them.

Tips:

- Take along washable cups or travel mugs instead of disposables; a lot of restaurants and stores will be glad to fill or refill your own mug.
- When you do use disposables like plastic cups, plates, utensils, and plastic food storage bags, don't throw them away! Wash and reuse them—most of them will last for a long time with many uses. They may not cost much to replace, but it doesn't make any more sense to throw away those things than it does to throw away your bicycle after one use.
- Reuse used glass and plastic containers as receptacles
- Reuse CD as Paper Plate Weights as CD will keep them from flying away!
- Use old clothing as rags for cleaning instead of buying cleaning rags.
- Pass smaller size but good quality clothing to others.
- Reuse plastic and glass containers as pots for planting.
- Never throw away an old book, donate it to a library or to your recycling centre, or a school! They can reuse it.
- Reuse your old toothbrush and use it to clean hard to reach areas like around the sink, your drains, faucets and grout.
- Above all you can be creative in reusing your old things and find as many different uses as you can.

Be creative.....



“

“One man's
trash is
another man's
treasure!”

”

So You can either "reuse" materials in their original form instead of throwing them away, or pass those materials on to others who could use them too! Just Remember,

So **When you do decide to replace something large and "reusable," be sure to donate the old one to charitable outlets. Citizens and students can organise what is called “Swap Shops”** And ask your neighbours to join in, too—this shares the work and increases the number of unused things that can find new homes and new uses. Many items that we might want to discard because we bought something new like clothes, books, childrens' toys, shoes, electronic items like television sets, mixer grinder, etc could still be useful to some one else. Instead of throwing such articles away you could collect them in such swap shops and give away to someone who might still want to use it. When you do need to purchase something, check those swap shops first to see if they have what you need before selecting something new.

Success Stories that can be emulated:

The first Swap Shop to be ever organised by a government body, was made successful in Kannur Collectorate, making it the first collectorate in India to organise one and showed the way for other collectorates and government machineries to follow. Many items including used clothes, electronic items including TV ,Computers, books, shoes, etc were given for free. Though the shops were meant to be open for three days, 90 % of the items were taken away in the first one hour. This is another success story for reuse concept.



Learnings from such Swap Shops:

Such swap shops broke the myth that the people of Kerala are averse to the idea of using second hand items and there would be no takers for such items. Also, it taught the mission how such items are in high demand actually and therefore how much of these articles were prevented from polluting the environment. This initiative also became a movement in Kannur District with many more such swap shops being organised all the time.

This is one activity that the mission expects the schools and RWAs to take up thereby preventing waste generation to a great extent.}

Some more innovations that promotes reuse:

1. Some countries have drop boxes which are designed for dropping specific items only. Some for old shoes, some for textiles, etc. They are then taken up by agencies and charitable institutions who mend such items and give away at a very nominal rate to people.
2. Repair shops should be encouraged. Simple items like umbrella, torches, etc are thrown most of the time because such repairing activity is dying . They are another group of enterprises that should have some form of incentives to ensure that more of them come up.

Source: MSW Manual

Promote development of eco-industrial parks, which are industrial areas where in material and resource exchange synergies, are established between businesses and industries. Such parks might operate facilities for recycling and product reuse processes.

Basically such industrial parks and repairing centres ensures reuse. Therefore a policy decision can be taken and system can be created at various levels to ensure that maximum repairing and reuse is done. Such people are also mainly found in the informal sector. How to integrate the informal sector is given in page 90.

THE 3RD R RECYCLE



“

if biodegradable waste is allowed to naturally decompose , it is not only the most environment friendly option for managing biodegradable waste but also makes this major portion of MSW, the least problematic as well as the least dangerous to environment and health due to its lower toxicity.

”

Definition:

Recycling is a process to change (waste) materials into new products to prevent waste of potentially useful materials, reduce the consumption of fresh raw materials, reduce energy usage, reduce air pollution (from incineration) and water pollution (from land filling) by reducing the need for "conventional" waste disposal, and lower greenhouse gas emissions.

Recycling can be looked at from two different categories.

1. Recycling of biodegradable.
2. Recycling on non biodegradable.

Recycling of biodegradable:

The concept of looking at leftovers in the kitchen as “kitchen waste” is relatively new in our country especially in a green state like Kerala.

Push the Rewind button for thirty years!!!



The habit of throwing away leftover food in the streets wrapped up in a plastic bag or burning them was not there. Most of the food waste was recycled in the backyard of households as garden manure or left to nature to do its job of natural decomposition.

The main carry home point is that food waste and other organic waste decomposes in a natural environment with no requirement of any special intervention. Problem arises only in the following scenarios.

1. Too much organic waste, accumulating in one place as in the case of dumping in urban areas. In this case, it becomes beyond the capacity of nature to degrade healthily.
2. Wrapping up biodegradable waste in plastic bags, thereby preventing natural biodegradation.
3. Dumping them on concrete which is devoid of valuable soil organisms which are crucial for natural decomposition.

Moreover, if biodegradable waste is allowed to naturally decompose, it is not only the most environment friendly option for managing biodegradable waste but also makes this major portion of MSW, the least problematic as well as the least dangerous to environment and health due to its lower toxicity.

Toxicity occurs only when the biodegradable waste is mixed with the non biodegradable waste that is loaded with chemicals, many of which are toxic and cancer causing. Hence the first and foremost requirement in waste management is to separate the household waste into biodegradable or wet waste and non biodegradable waste or dry waste which is called Source Level Segregation.

Source Level Segregation is the 'ABC' in the language of waste management. This is the starting point of a scientific Waste Management System. The main and the prime reason for the many failures of waste treatment plants can be attributed to the absence of this one main feature. Many plants including the ones that were closed down in Kerala were meant to treat the biodegradable waste but ended up receiving mixed waste including highly non biodegradable components due to lack of this one single, basic, essential mechanism.

It can be conclusively said that if Source Level Segregation cannot be ensured 100%, no technology or project can ever succeed and we will only end up in dumping or burning. It is like the foundation of a building and can never be done away with.

Even after achieving the first step, to bring all the household and commercial biodegradable waste to one centralised place is neither possible nor advisable, especially in Kerala due to the following reasons.

1. Paucity of land

Kerala is one of the unique places in the country, if not in the world. It is the most densely populated state in the country and perhaps one of the most densely populated regions in the entire world. Hence land availability for huge processing facilities is close to impossible. **More over the "Not In My Backyard Syndrome" is very strong in Kerala.** Hence putting up huge centralised facilities is very difficult especially in the near future. The only places where an Urban Local Body can find such land is going to

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Source Level Segregation is the 'ABC' in the language of waste management. It is like the foundation of a building and can never be done away with.

”

be situated in a Gram Panchayat which generally, always refuses to take waste from the neighbouring local body.

2. Operational Difficulties

Big centralised facilities need **high levels of skill, constant monitoring and effective institutions** to make it successful, all of which are close to absent in our ULBs. Hence it is very difficult to operate such facilities on all practical terms. This is evident from the failure of many such facilities.

3. Nuisance Value

As mentioned earlier when huge quantities of biodegradable waste is accumulated in one place for processing even minor mistakes in everyday maintenance can lead to huge nuisance in terms of odour, pests, air pollution and pollution due to leachate.. Hence it is **technically very challenging to maintain such facilities.**

4. Huge economic costs

Not only such centralised facilities will invite huge capital costs but also huge Operation and Maintenance costs. Moreover transporting all waste to one point involves huge transportation costs too including vehicle investment, their maintenance, salaries and fuel.

5. Huge environmental costs

Centralised facilities are more polluting and also the huge burning of fossil fuels used for transportation makes it the least environmentally sound option.

6. Huge Social costs

People working in such facilities due to accumulated waste are exposed to various levels of toxicity and hence the human element will also have to be looked into.

Considering all the above points it can be wisely concluded that a highly decentralised approach to biodegradable waste management is the best option. And going one step further Source Level Treatment of biodegradable waste at the household itself is the best option for Kerala.

This is not a new or unique idea. Even developed nations which once were promoting centralised facilities are now promoting

'HOME COMPOSTING' as is evident from the following documents.

Manual on home composting of Pembrokeshire COUNTY OF United Kingdom documents the following as European Union's objective

Home composting is the best environmental option, and it is recognition of this has encouraged the support of the provision of free compost Bins. ...organic matter decomposition and its subsequent return to the soil is a natural cycle upon which all life depends,

Although there is undoubtedly a need for centralised composting sites, as you can imagine, these sites can also have negative environmental and social impacts. For example:

- Transporting waste to the site and then removal of the finished product uses fossil fuels, increases noise pollution and traffic volume
- Machinery required for turning and moving the compost on the site uses fossil fuels
- Centralised composting facilities can be smelly and noisy.

Home composting is the best environmental option because it removes the need for fossil fuel use to create compost because the householder becomes both the waste producer and the end user of the finished product.

The government and local authorities have recognized this important role that home composting has to play in reducing environmental problems and the amount of biodegradable waste going to landfill.

European Commission's Commission Staff Working Document accompanying the GREEN PAPER On the management of bio-waste in the European Union makes the following observation.

Possible EU initiatives to implement the recommended policy scenario:

Progressively increase the biological treatment of high quality bio-waste by encouraging Member States to ensure that a minimum proportion of bio-waste is separately collected and treated **or treated by adequate home composting;**

“

...organic matter decomposition and its subsequent return to the soil is a natural cycle upon which all life depends,

”

The UNITED STATES Environment Protection Agency

which is like our Ministry of Environment and Forests has one webpage entirely dedicated to home composting or backyard composting as part of their waste minimisation strategy.

So....



At individual level, home composting is considered best for the environment and for Kerala particularly. Hence it should be promoted on a massive scale.

Based on the suggestions made by Suchitwa Mission, there is **now a Government Order of LSGD making it mandatory for all households to have composting facilities.**

This is a historic step as this is the first time in the history of waste management across the world that a government has brought out such an order. This is historic for the following reasons.

1. This is the first time, the government has given due recognition to the fact that unless every individual equally take responsibility for the waste they generate, we could not have an environmentally sustainable system of waste management.
2. This is the first time, a government has given a meaningful and mandatory public participation in MSW management.
3. This is the first time, the **subsidiarity principle** in waste management has been applied in a concrete manner.
4. This is the first time a government in a developing country, has taken a bold step of putting environment in the forefront, with much more teeth than many other nations.

Overall this is a very significant step in waste management as, at one strike, the single largest fraction of MSW can be handled with maximum ease, maximum environmental benefits and minimal complications, thereby minimal chances of failure.

Above all the major significance of this strategy is that only this can ensure

segregation. Because the simple logic is that, when the household themselves have to maintain the composting unit, it gives maximum incentive as well as necessity on the part of the household to segregate. Once segregation can be achieved, what it essentially means is that a major part of the remaining dry waste or NBDW can be salvaged for recycling.

At present the percentage of rejects in the total fraction of MSW is close to 30%. Rejects essentially mean the portion of MSW that can be neither be composted nor recycled. One of the main reasons for such high percentage of rejects is lack of segregation, because of which a major portion of dry waste becomes unredeemable for recycling, as food and other putrefying fraction of the MSW degrades the recycling value of the dry waste.

Why this means so much for recycling dry waste is dealt with in detail in Chapter 8. If one is curious they could always flip to page 74.

Arguments against home composting and their answers:

Argument No 1:

Decentralised and centralised management of biodegradable waste should go hand in hand. People need to be given options.

Answer:

This argument is akin to saying that both e office and paper files should go hand in hand and employees should be given an option. “ **It never works that way**”.

The conversion from paperfiles to e files would mean that the employee would have to actually learn and make the effort to make some changes in the way he functions. The employee can be educated to the maximum on the benefits of e office both for himself as a person and for the society. But the fact is that the human psychological process of taking the “ path of least resistance” and “resistance to change” is much stronger than any positive information and motivation to change for the better. Therefore when one says optional, hardly one or two would take up which would make no difference to the project. And e office can never become functional unless every single person changes over.

Point being, in certain cases options just do not work. Despite the well known dangers of not wearing a helmet people still do not wear one. Only mandatory law, is ensuring its usage. Pollution due to poor waste management is more dangerous than that. Carrots alone do not work. Sticks have to be bigger than the carrot.

Argument No 2:

Home composting puts too much onus on the citizens. It is not fair on the part of the government to expect citizens to do everything on their own, especially when SWM is the responsibility of the government.

Answers:

1. As has been already mentioned, in lesson no 5. , waste management cannot go any further unless each and every one of us take responsibility. The state of affairs that the environment of kerala has reached, demands such lifestyle changes. If each and every one of us wants to be a responsible parent, we need to be a responsible waste manager. As waste management is nothing but a medical emergency especially for our children.
2. Even if the government takes up the responsibility for BioDegradable waste, where is the space? All centralised plants have been closed down. Vilapilsala, Laloore, Sarvodayapuram. The list goes on. As already mentioned , they were closed not because the technology choice was bad, but because the capacities within the government machineries are not yet matured. Waste management in particular, demand that these capacities and systems are par excellence. Because one small break in one small link.....what we would end up with, would be mess, which no one is going to bear anywhere in Kerala. Such small breaks can never be prevented in an Indian scenario. Hence it is nothing, but close to impossible to make a centralised system successful. If it were possible, we would have not reached this precipice. Centralised systems have had their chance. They have failed. Therefore, there is no point in giving them more chances to fail. It is high time that this strategy be given the best shot. There is no guarantee that this would be 100% successful. But this is the one that can be achieved in the shortest time possible with strongest chances of success as it is already successfully going on in many places, provided the citizen is taking the responsibility.

Argument No 3:

Home composting is not a success either. It also leads to stink, worms, etc. How can we have such a mess inside our house?

Answers:

This answer will first be a question.(a little annoying one .. may be....)

Will your toilet give out fragrance, when you leave it uncleaned for a day or two? Or just because it stinks when you do not clean, would you stop constructing one in your house?



Well there was a time when people never felt the need to defecate or urinate at home. Even now toilets become defunct in many places, where they eventually turn into storage place for cow dung or what not? Does that mean

toilets are a failure and that we should only defecate in the open.

Issue is one of attitude and second is of maintenance. If one does not change his/her attitude towards using toilet no matter how many toilets government give they will remain unused. Similarly just like how a poorly maintained toilet stinks, a poorly maintained compost will also stink. We develop an attitude and thereby a habit to invest some time and money to maintain our toilets. Else they will be a nuisance too.

What human waste faced twenty years back is what our kitchen waste is facing today (both are biodegradable and of organic origin and hence the comparison). Both had a phase of ending up outside our home. Toilet waste is now being processed inside the house. It is high time kitchen waste also has its chance of being processed at home.

If one has enough soil within his home with many plants all they have to do is to put them onto the soil and into the garden or into a compost pit, for nature takes care of it as long as it is not wrapped inside a plastic bag or mixed with other NBDW.

What toilets faced twenty years back in Kerala, is what home composting is facing today. Both needs attitude change and maintenance. Proper maintenance never leads to unpleasant smell. Worms, namely maggots, if present are only natural agents of biodegradation. Actually they play a huge role in eating the pathogens. Few will be aware of maggot therapy, where they use them on gangrenous tissues to save valuable body organs from amputation. So let them peacefully help you compost inside the compost unit, if only you can find peace with them. They can never be a nuisance either with proper maintenance.

Argument No 4:

Many houses do not have the space, or time or money to compost at home.

Answers:

1. Indian market, specifically Kerala market has brought in such innovations, that home composting has become such a simple process.
- a. Options are available that will require a capital investment of hardly Rs.600. Some options require a monthly expenditure of Rs.100. Some do not require such a

“

What human waste faced twenty years back is what our kitchen waste is facing today. Both had a phase of ending up outside our home. Toilet waste is now being processed inside the house. It is high time kitchen waste also has its chance of being processed at home.

”

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Be a responsible parent, be a responsible waste producer and manager. Start composting at home.

”

monthly expenditure. Options can be exercised depending on the kind of area and the type of house one lives. Details are available on the mission's website.

Very few houses in Kerala can truly say that they cannot afford this. Kerala is one place where the spending capacity of the majority is one of the highest in the country. If someone still says they cannot afford, it is as already mentioned more of an attitudinal issue than an actual issue.

- b. **Space as less as two square feet is more than sufficient for home composting.**

When TV, tea tables and washing machines can find their space inside a home so can a compost unit. It could be conveniently placed under a kitchen sink or a balcony with no issues whatsoever.

- c. **Time as less as two minutes per day** to five minutes maximum is more than sufficient to successfully compost at home .

So as one can see, all the above arguments are just a result of the human psychology of resistance to change. But the ones who will pay the price for our rigidity will be none other than our own children. There is no point in investing so much money, energy and emotions for our children's future if we do not invest in building a future with a healthy environment for them. What is the use in our children having education and talents , when they cannot have good health because of our irresponsibilities .

Apart from homes, the basic idea of source level composting emphasizes the need for treatment of biodegradable waste to be managed wherever it is produced. We do have an amendment, a law which mandates commercial entities like marriage halls, restaurants and hotels, residential complexes to have their own, at source composting facilities. But not many abide by this law.

As this is a major source of biodegradable waste, commercial establishments too should play their part.

Success Stories that can be emulated:

For a change, this one is not documented by the mission though the mission was involved in the model a long time back. It is documented the by MSW manual itself . Hence it is reproduced verbatim here.

Decentralized Waste Management System for Apartment Complexes- A Public Private initiative in Kochi

Year of start: 2007

Main players: Cochin Municipal Corporation (CoC), Kerala Builders Forum now called Confederation of Real Estate Developers' Associations of India (CREDAI)

Approach: Kochi witnessed rapid urbanization in last few years with various developmental and infrastructural projects. As an outcome of this rapid urbanization, the city witnessed the problems of waste management and its disposal. The garbage crisis of 2007, deteriorated the condition of Kochi as the city had no dedicated place for waste disposal and waste was seen everywhere. In order to address the problem of garbage disposal in residential colonies with focus on health, hygiene and safety, a joint initiative was carried out by Corporation of Kochi and Kerala Builders Forum later called CREDAI. To manage the solid waste the following approach was adopted in high rise apartments to implement an eco-friendly solid waste management system:

- A suitable technology was identified and approved by Clean Kerala Mission, Government of Kerala and the implementation of this decentralized system of waste management in few apartment complexes on a trial basis was started in 2007.
- Planning and formulation of strategy and a dedicated team for implementation of the decentralized system for the high rise apartments
- Setting up of source segregated door to door collection system of waste in each of the apartment complexes.
- Establishment of the Bio-Bin system to process the bio-degradable waste to produce and utilize the compost on site within the apartment complex.
- Establishment of a recycling and plastic shredding unit by Corporation of Cochin and managed by CREDAI

- Collection of dry/ recyclable material is sold to generate revenue for the CREDAI workers
- Regular skill development and awareness programs through the print and mass media for the workers and citizens

Outcome:

- Currently 350 apartment complexes in Kochi are covered under this initiative
- Decentralized system in apartment complexes led to employment opportunities for economically weaker section especially women for operationalizing and monitoring of the unit
- Effective monitoring and timely complaint redressal at the time of any failure of the unit

Success factors:

- Legal framework making the system mandatory for all apartment complexes
- Proactive role of CoC to decentralize waste management within all apartment complexes and regular monitoring by the officials
- Capacity building of the workers
- Regular monitoring by CREDAI at the premises

Overall Sustainability:

The initiative of CREDAI in the apartment complexes is a self-sustainable working model showcasing the viability of decentralized waste management system. Onsite operation and maintenance of the composting system as well as other expenditures are being met by the collection of user charges at the rate of Rs. 100-150/- as well as sale from the recyclables. In order to further strengthen and ensure sustainability of the Manual on Municipal Solid Waste Management

Local Self Government Department (Govt. of Kerala) issued an order in 2012 for making it mandatory for the apartments through the building associations/ firms to manage the waste within the apartment complexes through different technologies for composting and sale of recyclable materials }

Garden Waste:

If there is space for gardening there is also space for composting then and there. **Pit composting, ring composting, bio bins are all options.** The twigs and branches, coconut shells might take longer time to compost but, if collected along with dry waste forward linkages can be created to places which require firewood requirement.

Biodegradable waste from other public places:

Market places can have their own composting facilities such **good examples are found in Thiruvalla and Thrissur.** Other biodegradable waste taken from various sources can be composted in smaller, highly decentralised composting and biomethanation technologies at multiple points in the city/town/GP. Decentralized facilities are easier to operate and highly economical too.

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Other bio-degradable waste taken from various sources can be composted in smaller, highly decentralised composting and bio-methanation technologies at multiple points in the city/town/GP. Decentralized facilities are easier to operate and highly economical too.

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COUPLING HOME COMPOSTING WITH GARDENING/ORGANIC FARMING



***From
Garbage
to Garden***

It's Compost Time !

“

Returning the compost back to the soil in urban areas reduces carbon dioxide content and Green House effect in urban areas to a great extent.

”

Home composting can be coupled with gardening and organic farming. There are two ways of looking at this necessity.

1. Soils are a natural carbon sink. (they absorb CO₂ from our atmosphere). Our soils are losing organic content and therefore their capacity to assimilate carbon in the air, is reducing. Returning the compost back to the soil in urban areas reduces carbon dioxide content and Green House effect in urban areas to a great extent.
2. We lose greenery in urban areas every day, once again removing our carbon sinks and making our cities and towns as “Islands of Heat”. Gardening in every house is an absolute necessity to reduce such harmful effects.
3. If it is kitchen gardening of vegetables it has the following advantages which is elaborated in the next section.

Importance of kitchen gardening

Just like cigarettes packs come with a statutory warning our vegetables and fruits should ideally have the following warnings.



Today's food is loaded so much with pesticides that there is absolutely no effective mechanism to check the rampant use of pesticides amongst farmers. The public also hardly are educated about the ill effects of pesticides and how toxic they are.

The above picture might feel like an exaggeration, but is very close to reality than one can imagine. Unfortunately the vegetables we eat and fruits we consume, which are supposed

to help human bodies to fight cancer, are themselves loaded with these potent carcinogens because of unchecked pesticide spraying. But they do not carry any warning.

According to the US EPA, more than 70 active ingredients known to cause cancer in animal tests are allowed for use. Although industry tests for a wide range of environmental and health impacts, the vast majority of pesticides currently on the market have not been fully tested. Pesticides often contain inert ingredients in addition to the active ingredients that are designed to kill the target pest. Unfortunately, the public is not provided information about what inert ingredients are included in pesticides in most cases.



Children are particularly susceptible to the hazards associated with pesticide use. There is now considerable scientific evidence that the human brain is not fully formed until the age of 12, and childhood exposure to some of the most common pesticides on the market may greatly impact the development of the central nervous system. Children have more skin surface for their size than adults, absorb proportionally greater amounts of many substances through their lungs and intestinal tracts, and take in more air, food and water per pound than adults. Children have not developed their immune systems, nervous systems, or detoxifying mechanisms completely, leaving them less capable of fighting the introduction of toxic pesticides into their systems.

Many of the activities that children engage in - playing in the grass, putting objects into their mouth and even playing on carpet - increase their exposure to

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Children are particularly susceptible to the hazards associated with pesticide use. There is now considerable scientific evidence that the human brain is not fully formed until the age of 12, and childhood exposure to some of the most common pesticides on the market may greatly impact the development of the central nervous system.

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toxic pesticides. The combination of likely increased exposure to pesticides and lack of bodily development to combat the toxic effects of pesticides means that children are suffering disproportionately from their impacts.

When pregnant women are exposed to pesticides it leads to genetic damage and cause developmental defects like the ones in the following pictures.

CONJOINED PARASITIC TWIN



Cyclops defect

I. Effects of pesticides in a nut shell:

CANCER

- leukaemia, non-Hodgkin's lymphoma, brain, bone, breast, ovarian, prostate, testicular and liver cancers.

ORGAN FAILUIRE:

- chronic kidney disease or intestinal nephritis

ENDOCRINE & REPRODUCTIVE SYSTEM

- Infertility
- hormonal imbalance
- and incomplete sexual development,



BIRTH AND DEVELOPMENTAL DEFECTS

- oral clefts,
- neural tube defects,
- heart defects
- limb defects.
- Autism
- ADHD

RESPIRATORY DISORDERS

- wheezing,
- chronic bronchitis,
- asthma
 - farmer's lung.



Educating the public on the ill effects of pesticide usage can encourage people to take up kitchen gardening so the compost produced at home can be used for the kitchen gardening if the households are interested. Not only such vegetables are pesticide free but cost free too making it economically viable.

Success Stories that can be emulated:

Before beginning this story it has to be said that it is the simple unknown, unsung heroes spread all across the state who teach the mission on how to go forward. One such hero is the school in the following picture which is situated in Kidangoor in Kottayam District.



This school has a successful collection of kitchen waste from school children, compost them in their school campus and then use the compost for organic farming on the terrace. The sight of a school doing such a great work was literally creating goose bumps.

Organic farming in terrace



One can see from the picture that trees like banana, fig and even coconut was grown on terrace. The school also has a plastic collection program which they send for recycling. If this school can do it, why can't our other schools, colleges and institutions do the same?

High time to stop complaining and start acting !!!

RECYCLING NON BIODEGRADABLE WASTE

Stop treating us like garbage.



India, our beloved country is a land of ironies. One could definitely find such ironies in waste management.

Irony No 1:

The most educated and the most affluent segment of the society who are expected to be aware and responsible citizens, cause maximum damage to the environment by producing more and more waste. Whereas the least educated and the most economically disadvantaged section of the society, are the most magnanimous saviours of our environment as well as our future. Wonder how?

The secret environmentalists that we are talking about here, are none other than the rag pickers, the waste hawkers and scrap dealers. It is a common sight (though many fail to notice in our busy lives) to see these rag pickers pick up articles like plastic bottles and other such articles from road sides, hawkers coming to houses taking away part of our trash even paying us for the trash they pick up and scrap dealers with their dirty shops full of scrap derived from the leftovers of consumerism. What is uncommon is the realisation of the fact, that, but for them the world we live in would have been more toxic and more dangerous. But for the amount of recycling, that these invisible environmentalists enable in our country, the highly chemical nature of the waste that we are dumping would have polluted our environment twice the amount it has polluted so far.

“

but for these informal recyclers the world we live in would have been more toxic and more dangerous.

”

The unsung environmentalists of Trivandrum city





The mission has documented atleast 700 such scrap dealers in the district of Trivandrum alone. A detailed list with contact nos and addresses of these scrap dealers all over the state is available on the mission's website.

Irony No.2

Another biggest irony is that, despite the fact that India recycles better than many developed nations through these silent environmentalists, the concept of recycling is close to unknown. Because majority do not know that, what these unrecognised people are essentially doing is recycling. This environment friendly livelihood of theirs save the valuable resources that would have been otherwise lost forever by unregulated dumping , thereby not only protecting the environment but also contributing in a great way to the Indian economy. **Because once the non biodegradable waste is dumped or burnt all the resources, money and energy that resulted in their manufacturing is permanently lost to the economy. These champions help recover these resources and give back to the economy.**

So not only are they the most humble environmentalists you can ever meet but also the greatest economists....in a way.

Irony No.3

In the past few years, developed nations especially in Europe- have been encouraging recycling to a great extent through a series of huge government interventions including very strict policies for recycling, awareness campaigns and promoting recycling schemes at various levels including businesses, shops and communities. Despite such interventions they could hardly achieve a recycling percentage of 40 to 45 %. Our country has

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Because once the non biodegradable waste is dumped or burnt all the resources, money and energy that resulted in their manufacturing is permanently lost to the economy. These champions help recover these resources and give back to the economy.

”

not had any policy on recycling though it finds mention for the first time in a Government of India publication namely the draft Manual on Municipal Solid Waste Management, 2014 of CPHEEO. So any guess on what could be the recycling percentage for our country?

Source: MSW Manual

It has been estimated that the informal sector alone recovers as much as 56% of recyclable material

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Our country has one of the most vibrant informal recycling sector in the world

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Surprising, isn't it? Believe it or not it is true that our country has one of the most vibrant informal recycling sector in the world. The MSW manual dedicates an entire chapter on this.

Excerpts from Draft MSW Manual, 2014.

2.11 Role of The Informal Sector

The informal sector, constituting kabadi system and waste pickers/rag pickers, plays an important role in the SWM value chain by recovering valuable material from waste.

They help reduce environmental impacts by improving resource recovery and reducing disposal requirements. The integration of the informal sector into the formal solid waste management system will contribute to the reduction of the overall system costs, provide support to the local recycling industry and create new job opportunities.

So.... How is that..... despite absence of policy or incentive from the part of the government our country has such a vibrant recycling sector? The following paragraph will explain that.

The History of the Economics of Recycling

Though the idea or the policy on recycling as an environmentally and economically sustainable way of waste management is relatively new the activity per se is pretty old , ancient as a matter of fact. “The virtue of recycling has been appreciated for centuries. For thousands of years metal items have been recycled by melting and reforming them into new weapons or tools all over the world. Such activities were high at the time of world wars in the western world.

During the industrial revolution, recyclers began to form businesses and later trade associations, dealing in the collection, trade and processing of metals and paper. In the 1930s many people survived the Great Depression by peddling scraps of metal, rags and other items. In “those days” reuse and recycling were often economic necessities. It was only when the industrial societies began to produce ever-growing quantities of products after products to feed the newly developed consumerist society, which greatly incentivised the ‘use and throw culture’ that they forgot this activity.”

What happened in ‘those days’ in the developed world is what is happening at present in our country. The basic fact is that every country during its developing phase, recycle as a purely economic necessity, because the manufacturing and economic capacity to produce more and more goods from raw sources would not have reached its peak and therefore producing new products from scrap is more economical than manufacturing them from raw material.

Let us take a simple example, like making plastic products, to understand how this works. Take a plastic rope for instance. Raw material to make this product would be Crude oil. To manufacture a plastic product from crude oil would mean that, the chain starts from exploring and drilling the oil, importing the crude oil





(which is very expensive), refining it, processing it to produce polymers, then further process it to produce the rope. A manufacturer will have to bear the entire cost of manpower, energy, transportation and so on that goes into each of this link in the chain. For him, the shorter and cheaper chain is to get the plastic scrap from the scrap dealer, melt the plastic into granules and produce the final product rope.

Guess where one of such industries, which is documented in the following pictures is situated....

Guessed yet?...Ready to be wrong?...

This industry is situated in Kuthuparambu Industrial estate in Kannur District. Yes...We are recycling right here in Kerala. But how many of us are aware of this?

Thus it must be now clear that there is no doubt that we have a very vibrant recycling sector right in our soil which happens silently, without any government support (so far) and with no protest or demand to shut down due to NIMBY syndrome. As a matter of fact this industry comes under the category Green with minimal or nil pollution.

“In the West, they now recycle because they know that doing so is essential for conserving our planet’s resources. However, for a country like India, recycling often isn’t a choice, but a necessity of life.”

These fundamentals apply to almost every type of product, be it metal based, glass based, paper, virtually everything. There are recycling industries which recycle paper, glass, metal, e waste and of course plastic as seen above, which are scattered all across southern as well as northern India.

In recent times, developed nations have taken up recycling for environmental necessity. Our country has been recycling due to economic necessity. We have now also realised our environmental necessity. This is a very opportune moment where both economic necessity to recycle and environmental necessity to recycle co exist. Not many nations would have had such a moment or phase.

Before we lose our economic necessity which we soon will, (just like the industrially mature developed nations did) we have to pull all our acts together to make it an environmental necessity. We as a state is just at the right moment to make this economic necessity and environmental necessity complement each other. If we lose this moment it might be an opportunity lost forever.

Before going any further let us look at some facts and figures compiled from various sources, that explains why recycling our waste is the most environment friendly option. This is to convince the reader one step deeper, why we should recycle rather than dispose:

Just to let one know the importance of recycling the following points would highlight the benefits of recycling.

Benefits of recycling:

Conserves Natural resources:

Each and every item we use in our everyday life comes from raw materials that in turn come from natural resources. What we do not realise very often is that most of these resources are finite, **“non renewable resources - they cannot be replenished by nature within our lifetimes and are therefore, in limited supply”** be it oil or metal ores or other resources like limestone, gypsum, etc. How can we sustain if we keep on drilling new places for oil and creating new holes on our mother earth by mining minerals. One day there will be nothing left to drill or mine.

Recycling ensures that the need for new raw materials is greatly minimised and therefore manage our limited resources in a sustainable manner.

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This is a very opportune moment where both economic necessity to recycle and environmental necessity to recycle co exist. Not many nations would have had such a moment or phase.

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“For example,

- **recycling one ton of paper saves the equivalent of 17 trees and 7,000 gallons of water.**
- Every ton of steel recycled saves 2,500 pounds of iron ore, 1,400 pounds of coal, and 120 pounds of limestone.
- Recycling one ton of glass saves the equivalent of 10 gallons of oil.”

Saves energy:

- Manufacturing products from raw materials is highly energy consuming. India is an energy deficit country. That could be one reason why we have such a vibrant recycling sector. So in an energy hungry country like ours recycling makes all the more economical as it requires lesser energy to make recycled products from scraps rather than producing virgin products from raw materials.

For example

- **recycling of aluminium cans saves 95 percent of the energy required to make the same amount of aluminium from virgin sources. For each can recycled, this is enough energy to run a television or computer for three hours.**
- Recycling just one plastic bottle will save enough energy to power a 60 watt light bulb for 3 hours.
- The recycling of one glass container saves enough energy to light a 100-watt bulb for 4 hours.
- For every pound of steel recycled, it can save enough energy to light a 60-watt bulb for 24 hours.
- Every ton of paper recycled can save up to 4200 kilowatt hours of energy.

Saves environment:

Last but not the least is that recycling protects environment in more than one way.

- The various elements found in our modern day waste including heavy metals are not only toxic but also valuable to manufacturing industries. Hence recovering these materials through a well managed recycling program makes sure that such toxic elements do not way find their way into our water and soil and thereby into our body. Hence recycling greatly helps our environment from environmental toxicity.
- By reducing our need for new raw materials it helps protect our natural resources from deforestation and mining and thereby reducing our disturbance with the ecological balance of such places.
- Industrial waste today is the main source of all types of pollution. Recycling of industrial products such as cans, chemical, plastics helps to cut down



Paper and paper base products:



Paperboard and cardboard



Aluminum and metals Including aluminium foils, cans. etc



Construction and demolition waste



Glass products



Plastic containers #1-7



Electronic waste

pollution levels considerably, as these materials are re-used, in place of the high levels of pollution that would have been otherwise caused due to fresh industrial production from raw materials.

- By reducing our energy consumption, recycling requires less burning of fossil fuels, as mentioned earlier. Therefore our green house gas emissions are reduced, thereby reducing global warming.

One might now ask why is that despite having such vibrant entrepreneurs (yes, it is an entrepreneurial activity that has to be promoted) in our country,waste is still a problem. The reason for the above question can be remembered as the following four S.

The reasons due to lack of

- **System**
- **Segregation**
- **Scale**
- **Space**

1. System:

The main reason is because we have not yet created systems that enable such industries to manage our waste. And that is because we have hardly looked at management of waste as a self sustaining business model. We have always looked at this sector as a liability that would require huge investments from the government, totally not realising that recycling could be an enterprising industrial activity, which it already is. We have virtually never looked at this industry as one of the major solutions of our waste problem.

So the first and foremost step that needs to be taken is to capitalise on this opportune moment. **We need to put in various economic instruments to encourage such industries in our soil. Examples would be to give them tax incentives, providing land and other facilities, giving them a Viability Gap Funding, etc.** The mission in consultation with other departments is in the process of working on a framework on how to encourage such industries. The recent tax exemption on recycling equipments which was announced in this budget is one such effort.

Even if such industries do come, we can never ensure 100 % recycling of all the recyclables due to the following reasons.

2. Segregation :

As already emphasized segregation is the key to an effective waste management system. The portion that is not recycled is mainly due to this basic reason. The high percentage of rejects in our total MSW is also because of this reason.

Why is that segregation at source so important?

When a household gives mixed waste wrapped in a plastic bag, by the time secondary segregation happens an average of three to five days would have passed. This means the waste inside the bag would have done a lot of ‘social networking!’. Meaning ,

- a. Organic and inorganic portions would have reacted with each other and the acidic environment created would have degraded the recycling value of all the recyclables inside the mixed waste.
- b. Vice versa also happens. All the heavy metal contamination of the organic portion would have happened too. **The compost done of organic waste obtained from secondary segregation would have the highest chances of heavy metal contamination.** Such a compost will not be a soil conditioner but a soil poisoner.

Point (a) is the reason why we emphasize home composting. Because the only strategic way of ensuring segregation is when people have a necessity to segregate as mentioned in page 50-51. **also that is the only way we can ensure that recyclables do not lose its recycling value by getting mixed with food waste.**

This is where the demand for the next lifestyle change comes from the mission. The one and only way to ensure that maximum recovery of recyclables is achieved, is for all of us not only to segregate but also clean the dry waste and store it, particularly when it is having remnants of food. For example aluminium foils in which the food packaging comes (ideally we should go back to the old habit of taking a tiffin carrier to buy food from hotels to avoid disposable packaging) has a high recycling value. But when it is thrown along with curry or other food remnants and allowed to rot for three days it loses all its recycling value. Basic point is, one cannot afford to have organic portion sticking to dry waste at any point of time. It becomes unredeemable. Hence it is an absolute necessity for recycling, that we give away 'clean and dry' dry waste.

Point (b) is one of the many reasons that the mission discourages centralised composting. Because no matter how much you educate the need for segregation, in an Indian scenario segregation can never be achieved satisfactorily to ensure production of a good quality compost. The forward linkage for such a compost will fail making such centralised plants unviable economically in the long run.

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One cannot afford to have organic portion sticking to dry waste at any point of time, else it loses its recycling value. Hence it is an absolute necessity for recycling, that we give away 'clean and dry' dry waste.

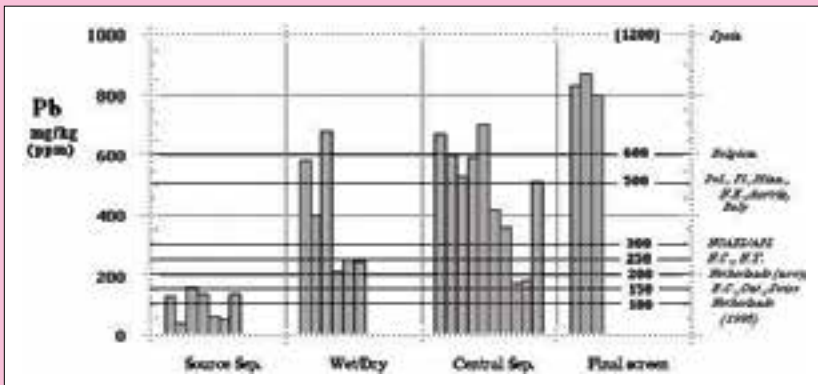
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Research papers supporting the need for source segregation for good quality compost

Source:1. Department of Agricultural and Biological Engineering Boyce Thompson Institute for Plant Research Cornell University

Understandably, many potential compost users are concerned about physical and chemical contaminants in composts made from mixed refuse.... Those metals of greatest concern in compostcadmium, mercury, and leadcan be harmful to animals and humans at relatively low concentrations and tend to accumulate in soil, plants, and animals.

Where minimizing metal contaminants is the goal, evidence from both experimental separation trials and operating facilities present a strong case for source (e.g. household) separation of waste. In fact, the earlier that sorting occurs during the collection and composting process, the lower the metal contamination in the finished compost (Figure 1).



Researchers in Germany and the Netherlands have compared both source separation of organic materials and wet/dry collection (Option 2) with centralized separation prior to composting (Option 4) and final screening only (Option 5). Source separation composts have the lowest contaminant levels, Scale:

A Cornell study analyzed published heavy metal data from over 100 operating MSW composting facilities in Europe and North America. Source separation of organic materials produced significantly lower contaminant levels than centralized separation (Figures 2 and 3).

Source 2: Environmental and Health Impact of Solid Waste Management Activities

By Royal Society of Chemistry (Great Britain)

To produce high quality composts it is far better to ensure that contaminants do not mix with the compostable waste by source separation or by composting at home. If the individual householder composts organic refuse at home, not only is it removed from the waste stream, but the householder has complete control over the type of refuse he adds to the compost heap and can therefore include only biodegradable material.

Source 3: Improving Municipal Solid Waste Management in India:

A Sourcebook for Policymakers and Practitioners P U Asnani, Chris Zurbrugg

Composting from mixed waste should be avoided; research results show that compost from mixed waste barely meets National Quality requirements for compost due to heavy metals and other pollutants.

Source 4: Heavy metal sources and contamination mechanisms in compost production

- G.R.E.M. Van Roosmalen,
- J.W.A. Lustenhouwer,
- J. Oosthoek,
- M.M.G. Senden

The main problem for the use of compost in agricultural applications is the high heavy metal content of this soil improver. Experimental results obtained in various large scale operations in the Netherlands are reviewed. There are clear indications that the best results are obtained by source separation of the organic waste.

Thus it become very clear that composting in a centralised facility entailing secondary segregation of mixed waste can never be healthy to the environment nor to the people

One cannot afford to have organic portion sticking to dry waste at any point of time, else it loses its recycling value. Hence it is an absolute necessity for recycling, that we give away 'clean and dry' dry waste.

3. Scale:

The informal recycling sector operates at three levels:

A. Rag pickers and Hawkers:

They form the base or the foundation. They collect scrap from roadsides and houses and sell it to the next in the pyramid, who are the small scale retailers.

B. Small scale retailers:

They buy it from these rag pickers and hawkers and then sell it to the wholesalers.

C. Wholesalers:

They buy it from the retailers and transport it to recycling industries all over the region.

What essentially A and B are doing is that they are bringing scale to the entire operation. A and B bring secondary segregated dry waste to C. For example the articles they collect will range from plastic bottles, plastic buckets, a range of plastic products which are of different quality (HDPE,LDPE,etc) , paper, card board, glass, e waste,etc,etc each going into separate recycling industry. So each of these items have to be sorted and stored till it comes to a scale. A scale here is to bring each of these items to a truck load so that they can be transported. The small shops essentially act as a sorting and storing place.

So this sort of sorting needs space.

4. Space:

The above requirement of sorting and storing to bring to scale needs space. The following pictures will give an understanding.



Once again you will be surprised to know that **this yard belongs to a wholesaler who belongs in Trivandrum.**

So if all of household waste has to be sent for recycling we need spaces like the above yard. Such spaces are what we call a Material Recovery Facility. It is referred to by other names like Resource Recovery Centre or Dry Waste Collection Centre. All these names basically imply the same thing. A temporary storage and transition point for the collected recyclables. This is one of the basic steps that local bodies have to do. **Finding a 1000 sq feet for every 10,000 population on an average for such a MRF is the basic step for recycling.** The business model will be explained in the next chapter.

Success Stories that can be emulated:

Our strategy of recycling found a natural partner in Kannur District. The industry mentioned in the preceding paragraphs is located in Kannur District. So forward linkage for the plastic waste became a permanent one. With a lot of campaigning and efforts from the local bodies and District Suchitwa mission, people were motivated to deposit clean and dry plastic. The collectors who are from Kudumbashree in most panchayats were trained to say “no” to unclean plastic and strictly collected only clean plastic. They then sorted and bundled it in small rooms and shops which essentially acted as mini MRFs. Since the collected plastic was only clean and dry plastic there was no issue of smell, rats or pollution, no issue of NIMBY syndrome and such collection centres were situated right in the middle of the main area of panchayats. Some right in front of the Panchayat Office and

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The time is now ripe to stop looking at waste management as a liability and start encouraging entrepreneurs to play their role, thereby government can act as a facilitator and regulator, rather than taking the entire burden.

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others in the middle of a shopping complex, which can be seen from the following pictures.



These materials are then transported to that rope making industry in Kuthuparambu and recycled.

The basic mechanism for the success of this model is this industry created the demand for plastic waste.

The basic market mechanism is already in play in the Indian recycling sector

Demand



Supply



Close to 11 panchayats and a municipality in Kannur District became a supply chain to this demand and put in systems to ensure the supply of plastic. This shows the demand - supply chain of a typical business market.

Above all the major success was because the local bodies and the collection agents strictly ensured collection of only clean plastic which once again proves the importance of giving away clean and dry waste.}

Key messages for decision-makers

(source: MSW MANUAL)

Decentralized solid waste management systems are preferred to reduce the environmental and monetary costs of transporting waste over large distances. Collection of recyclables, composting of organics are some of the activities which can be taken up at the local level, either at a colony level or ward level. Processing/treatment and disposal facilities, which are viable only at a certain scale, like recycling facilities, RDF plants and municipal sanitary landfills, should be planned for at the centralized/regional level, depending on the size of the ULB. Decentralized MSW management facilities may be funded through community based co-operatives, local NGOs, PPP mode or through municipal funds. Community ownership of decentralized systems is critical for their success and continued operation.

Hence the time is now ripe to stop looking at waste management as a liability and start encouraging entrepreneurs to play their role, thereby government can act as a facilitator and regulator, rather than taking the entire burden.

What needs to be done to promote recycling:

1. **Recycling parks can be set up which are essentially a place where recycling industries** meant for all streams of waste are operating. Not that all such industries have to be in the same place. But the basic point is that such industries should be encouraged.
2. **Financial instruments that greatly incentivise both the backward linkages and forward linkages of the recycling industry** including tax exemption, Viability Gap Funding or soft loans, subsidy on recycled products, etc can be brought about.

Key messages for decision-makers

(source: MSW MANUAL)

The MSWM system is dependent, inter alia, on a well-planned implementation of the concept of 3Rs, and involvement of the informal sector. ULBs may chart out well-defined strategies for waste minimization, recovery and segregation involving the informal- MSW manual sector directly or through RWAs/ CBOs / NGOs or the private sector.

We are now proceeding to the most challenging portion of MSW.

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Since finding such a huge tract of government land for a sanitary landfill would be very difficult in Kerala, acquisition of land has to be seriously considered.

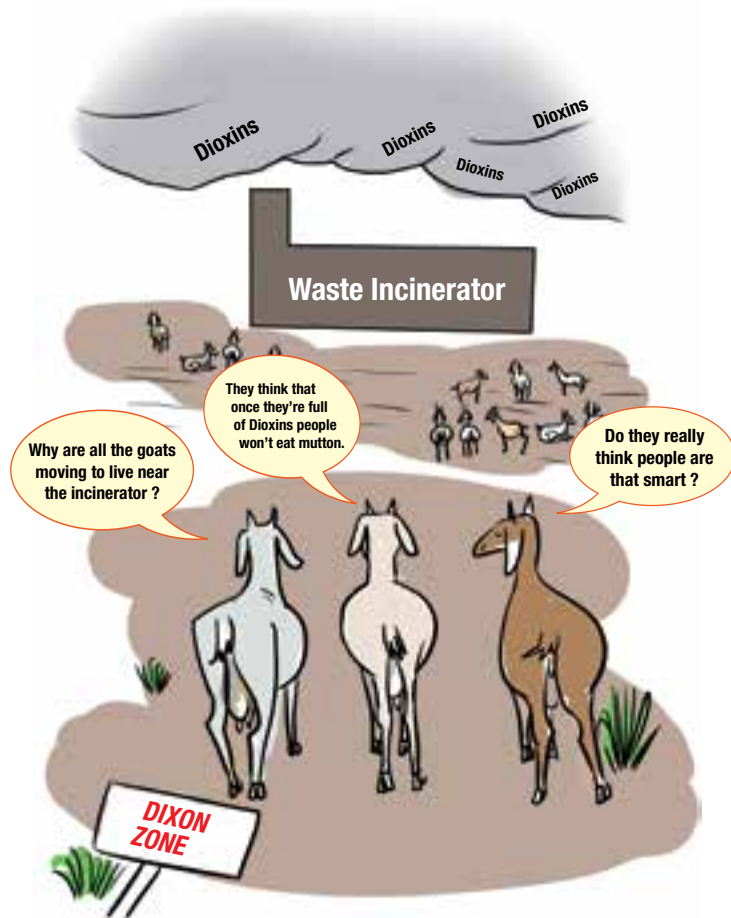
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SANITARY WASTE, REJECTS AND INERTS:

Before proceeding any further, it becomes imperative to discuss a very unhealthy trend that is developing recently. This might sound highly critical but this criticism is absolutely essential for the welfare of the state.

We had discussed in detail why waste cannot be burned. Likewise it cannot be incinerated either. Especially the kind of incinerators that are installed in apartment complexes, the ones local bodies are installing without any form of approval or the kind they want to install and push the mission to give technical sanctions, which the mission will never give. These incinerators are doing nothing but bringing roadside and backyard burning inside a metal machine.

Remember the two chemicals that is to remembered every time you burn waste. Well remember them more now.



The following are very crucial facts which every one should know.

1. Many of the incinerators that are being installed have no approval from Pollution Control Board (PCB).

Therefore they have absolutely no pollution control equipments making their smoke at least twenty times more carcinogenic than cigarette smoke. Above all this smoke disperses to distant areas within the region making the atmosphere over Kerala towns and cities, possibly more dangerous than any other state. Worse, India still has not mastered the technologies for measuring such dioxin and furan emissions as they are one of the most difficult atmospheric pollutants to measure. Check any air pollution data of our cities. You can hardly find mention of these two chemicals. Not because they are absent in our air, but because we do not have the equipments to measure them.

2. The biggest news is that until recently, our country didn't even set standards for dioxins and furans. Even now, the website of CPCB only has given the proposed standards which has not yet become enforceable.
3. Even if standards are set, in order to ensure that the incinerator has to have very minimal emissions of dioxins and furans and other pollutants, high technical standards have to be maintained. For instance, a temperature as high as 1000°C is required, contrary to the 200°C temperature (many times even less) is maintained in these kind of incinerators. It needs to have a proper flue gas cleansing system and so on, none of which are found in these substandard incinerators.

It is now crystal clear that installing such sub standard incinerators is a guaranteed way of increasing the risk of cancer for all those who live next to it. It is the earnest appeal of the mission to everyone, not to install such incinerators. It is understood that people do it out of no choice, but it has to be known that burning sanitary waste is more dangerous than dumping it. This is a scientific fact, as the polymers in sanitary pads and the chemicals used to make it white, all have dioxins and they are released into the air when you burn them.

So what do we do with them?

The suggestions made here regarding the sanitary waste and rejects once again might not conform to popular opinions. But it is still being made because, as already mentioned all

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People of Kerala already have the highest civic sense in the country. This should be taken advantage of and further campaigning and education should be done to ensure that they deposit only segregated waste.

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these suggestions are made with futuristic concerns, giving due importance to environmental sustainability. The mission will not spell out any firefighting solutions or crisis management techniques. That is not the mandate of the mission. Our mandate is to roll out a plan and act as a technical advisory body for agencies to follow. Therefore this document is not going to deal with damage control but it is about damage prevention.

SANITARY WASTE

Having said that, for the time being sanitary waste should be treated like biomedical waste as they are contaminated with bodily fluids and therefore separate collection of sanitary waste should be done and sent to the incinerators meant for hospital waste. The incinerators meant for hospital waste follow PCB Standards and are being monitored by PCB regularly. If this policy decision can be taken, then this is the safest option we have right now. The mission is already working with IMA (Indian Medical Association of Kerala) and is expected to come up with a comprehensive plan for sanitary waste. A fact that not many would know is that the ash from these bio medical waste incinerators is very toxic and they need to be landfilled in a properly designed hazardous waste landfill. Hence a properly designed hazardous waste landfill has to be constructed.

REJECTS AND INERTS:

The rejects and inerts form that part of the MSW which can neither be composted nor recycled. This could comprise of mixed waste due to lack of segregation, residual waste from processing, street sweepings, those materials which cannot be recycled and others. **Our main aim should be to reduce the percentage of rejects in our waste stream. But till we have perfect systems in place such rejects can go to a sanitary landfill for the time being.** This is different from an ordinary dump site, in that, a sanitary landfill will have protective layers which will prevent toxic chemicals from getting out, a leachate collection facility and so on.

Of all the options of disposal, landfilling is safer (once again only for the time being) because, a properly designed landfill gives a better control over the pollutants (mainly heavy metals), which can be safely confined. Ideally we will require one sanitary landfill per district with an area of minimum 15 and ideally 30 hectares, which is away from residential areas and which could have a minimum life of 20-25 years(Source : MSW manual). It is neither technically nor economically feasible to have a sanitary landfill in every local body. Constructing and maintaining a landfill is one area which needs government investment and this has to be a centralised facility. It is a highly technical as well as an expensive affair. Details of landfills are given in Draft MSW manual, 2014.

Since finding such a huge tract of government land would be very difficult in Kerala, acquisition of land has to be seriously considered as a sanitary landfill is more important than any other infrastructure projects, for which land is being acquired all the time. Another option is constructing a sanitary landfill

in abandoned quarries which are many in Kerala. But construction of a safe scientific landfill from abandoned quarries is a highly technical feat requiring special design measures and has to be done very carefully.

Since landfill projects have to be planned at the regional level or district level and since it will require huge capital costs, this responsibility needs to be ideally taken up at the state government level rather than at the local body level.

Landfilling is only a disposal mechanism which should be given the least priority. Maximum efforts should be to reduce these rejects. Identification of land and construction of such a sanitary landfill might take a minimum of two years. That gives us the time to put in systems to minimise the rejects going inside the landfill. Only when the maximum efforts of reducing, reusing, composting and recycling are taken up, should we look at landfilling as an option. Else the tendency would be to landfill everything and the landfill will be filled within one year.

Now, even such landfills have a life. We cannot go on finding 30 hectares of land that cannot be used for a total of almost fifty years, all the time. Construction of landfill should ideally be a one time affair. That gives us a breathing time of 20 years within which time our ultimate goal should be to aim at Zero Waste Systems.

This is the time to recollect once again, the great saying

“Waste is but a design flaw”.

What the mission is trying to say cannot be better put than the following words of a great professor, Paul Connett.

"if we can't reuse it, recycle it or compost, industry shouldn't be making it."

This might sound too extreme and utopian. But this is the way forward. Changing our systems and designs in such a manner that we reduce the need for both disposal mechanisms as well as the need for new raw materials is the only wise way to go forward.

Never discount this as impossible. The kind of technological era we are living in makes any seemingly unimaginable stuff possible provided there is a vision. When Bill Gates dreamt that there should be a computer on every desk people thought the same would be “impossible and extreme”. But it was his vision that made the seemingly impossible task possible. All we need is to have this vision of a Zero Waste society with a target of twenty years. It gives us enough time to come up with innovations that will ensure sustainability. Biodegradable sanitary pad is one such innovation. We need to create systems that incentivises such innovations, that enable recycling and sustainability and disincentivises products and designs that cannot be recycled.

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It is high time for Kerala to present another success story to the world.

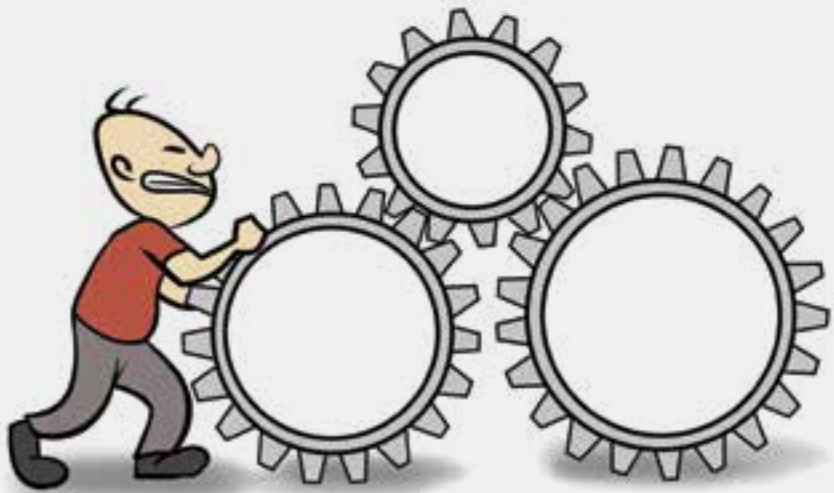
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Public places:

Coming to public places. Every public place should have a two bin system for bio waste and non-bio waste. Wherever necessary a separate bin for sanitary waste should be kept. People of kerala already have the highest civic sense in the country. This should be taken advantage of and further campaigning and education should be done to ensure that they deposit only segregated waste. This is not an easy task and will not be achieved overnight.

But the education on sanitation is a continuous one. It is not a one time affair. IEC on sanitation should become part of our system. It should become an integral part of our education system. It should become an integral part of our culture. This is why we say that sanitation is more of a cultural challenge rather than a technological challenge. This is a peculiar challenge to our country. As somehow Indians have always been looked at as dirty. It is high time that best efforts are taken to change this unwelcome perception. But once again, Kerala being a society with comparatively better civic sense compared to the rest of the country, (nevertheless kerala still needs a lot of improvement compared to developed nations) , it can act as a role model to the entire country.. Similar to the Kerala model of successes, available in various sectors, the mission strongly feels that Kerala is the one state, that has the biggest potential in showcasing yet another successful model on waste management to the entire country. As a matter of fact as this model is one of the most environment friendly model in the entire world, Kerala can show the world how to manage waste.

OPERATIONAL MODEL



Having explained all that there is to the reasons for adopting this strategy we will now look into how to make this strategy a successful business model.

Step 1: Identification of Collection Agents

A group of dedicated and sincere collection agents have to be identified.

They could be Kudumbashree, or any other group of individuals.

They could also form a self help group. **Ideally an NGO or any other independent entity including business groups if available can spearhead and guide these collection agents as well as operations.** The local body as already emphasized should act as a facilitator to bring all these people together on a single platform. This reduces the burden on the limited manpower of the local body. But the local body should also not forget their regulatory role and have a strict monitoring mechanism on this entire set up.

Here the mission would like to convey the message that once the local body spells out a clear strategy and reaches out for partnership, there are ennn number of people who will come forward to partner. It is only a matter of willingness and readiness to seek out for such meaningful partnerships. Waste management has to be a social project. There will be no “social” if only government machineries are there.

Step 2: Training of Collection Agents

They need to be trained. The mission can support these training requirements. As a matter of fact the mission is already organising many such training programs. Soon the mission is planning o increase the number and spread of such training programs. There are many other institutions also, who could offer this training.

The training is no rocket science. **The agents have to be trained on the nuances of composting so that they become technical resource persons who can help maintain the home composting units for the households and others. Then they should be trained on how to sort the dry waste and store them separately.** As a matter of fact many of these field agents who are already into the business know this job much better and might need no training. Above all they should be trained to collect only ‘clean and dry’ dry waste and also say a strict ‘no’ for kitchen waste and soiled dry waste. Saying no is one of the toughest job in the world and hence this definitely requires training.

STEP 3: Putting systems in place

Start a system of collection, transportation and storage for dry waste:

Start a system of collection, transportation and storage for dry waste and dry waste alone. When only dry waste has to be collected, it would be more than enough to collect once a week or once a fortnight depending upon local differences in waste generation.

A strict decision to collect only dry waste has to be taken at the local body level. and a strict message has to go that Kitchen waste, the non toxic portion of MSW is the household's responsibility. Only then that the houses will take up home composting.

It is the toxic NBDW that requires immediate attention and only that will be taken away from houses. This one step reduces the burden of the local body by 50 % which is the expected fraction of Bio waste in total MSW.

STEP 4: Establish an MRF (Material Recovery Facility):

Otherwise called Resource Recovery Centre (RRC) or Dry Waste Collection Centre (DWC), is the temporary transitional storage and working space for the agents to do the sorting, bundling and storing. It is nothing but a working shed as illustrated on pages 78. **If collection is strictly limited to 'clean and dry' dry waste, this facility has absolutely no chances of any level of smell, nuisance or pollution and hence should not be a problem to put such facilities at multiple points in the city without much opposition from public.** Even if it does come, it is high time to show some iron fist.

STEP 5: Create a forward linkage:

There are many recyclers who are ready to take this material. A detailed list with contact nos are available on the mission's website. Any trouble shooting, the mission can be contacted and the mission will try its best to support the local bodies.

Now how can this system work as a self-sustaining business model with minimal investment from the local bodies?

1. The households will have to be charged for collection of their dry waste **(A)** if the charge can be linked to the volume of waste collected that would be the best case scenario as that would encourage waste minimisation which is very essential. But if one feels it is too complicated, one can begin with a simple payment. But slowly systems should be introduced to charge as per the quantity of waste generated.
2. It could be left to the household whether they compost themselves or they want the agents to maintain their compost. If they want to avail the service of the agents then they will be charged separately. **(B)**

At the same time, the same agents can also be used as monitoring agents to check what each and every household do with their biodegradable waste. For dumping outside their house or burning they should be fined.

3. Sometimes households might need some assistance for troubleshooting or maintenance difficulties. On paying a minimal charge **(C)** the agents could offer that service.
4. Once again if the household likes to take their service for maintaining a kitchen garden, they could do so with a payment to these agents. **(D)**

5. The agents do the work of sorting and storing of dry waste and they could sell it to recyclers, which becomes their additional remuneration. **(E)**.

A+B+C+D+E becomes the remuneration of these agents. The exact payment is left to be decided by all involved depending on local conditions. Also because the compost from home composting would have very minimal or nil content of heavy metals forward linkage of such compost to farmers or others could also be an additional source of income **(F)** if well planned.

One possible challenges to this model could be the willingness or the lack of it to pay

If not many, some people might ask “why should we pay ? Are we not paying our taxes. Is it not the local body who has to give us this service?”

As already mentioned the answers to this are two words.

1. Responsibility
2. Sustainability.

It has been emphasized enough in this document that it is each and every one of our responsibility and we need to enable self sustaining business models so that it becomes a livelihood opportunity for the people engaged , which in turn incentivises professionalism and customer satisfaction. User charges becomes an essential component to ensure quality of service as well as sustainability of the business model.

Speaking of livelihood opportunity, this is where the need to integrate the informal rag pickers and hawkers into the formal system is required. Because their lives are already dependent on waste, it makes perfect sense to give preference to them and other workers and involve them in such projects. This has a three fold advantage.

1. They are already into the business and hence training them and making the model sustainable becomes easier.
2. They have every incentive to make this model successful as this is the only (or may be the main) livelihood job they have been having.
3. Such informal environmentalists who do not have any security or identity can be given a respectable position in the society.

Steps that can be taken to formally integrate the informal sector:

1. First and foremost an ID card has to be given. A registry system can be introduced. It could be integrated at the state level, which if initiated at the local levels the mission can take this responsibility.
2. Bank accounts can be opened for them. This enables them to avail loans, form effective self help groups and essentially give them security and respect.

3. The existing Community Health Insurance Scheme can be extended to them.
4. Just like Know Your Customer , in some places, Know your Sanitary Worker programs are organised by Resident Welfare Organisations. Such programmes make a huge difference in motivating them. They do one of the biggest services to humanity. Each and every one of them, is like our father of the nation, who lives what he preached namely “Sanitation is more important than political independence”. Therefore they command the same respect. High time our society give them that respect.

Activities of the mission in pipeline:

1. As many new innovations in technology have come up, the mission is in the process of identifying the best technology providers that is strictly in tune with this strategy.
2. A registration system for those involved in the informal recycling sector is going to be introduced. The mission hopes that apart from formally integrating and streamlining their business, some benefits can be extended to them. The mission is soon coming up with a comprehensive plan for this informal recycle sector
3. Empanelment of NGOs who would like to work in this sector
4. A massive awareness campaign is planned in order to popularise this approach and motivate people to bring the lifestyle changes that is mentioned in the document.
5. A summit will be organised that will provide a platform for environmentalists, philanthropists, business entities who want to contribute, technology providers, Civil Society Organisations, Non Governmental Organisations and people to come together and take this people’s movement forward. The mission expects this to result in a multiplier effect.
6. A comprehensive material use policy that establishes a roadmap for the next few years during which time environmentally degrading materials can be replaced with eco friendly ones.
7. Bringing in a policy for Extended Producer Responsibility.

SUMMARY AND ACTION POINTS



The system we design for managing solid waste should be done so in such a manner, that we pass down a healthy planet to a healthy generation. Hence, a system that aims at maximum recovery of resources that is in sync with the natural cycles of this planet with minimal or nil pollution, has to be planned. Such a system necessitates lifestyle changes from each and every one of us without which we will cause irreparable damage to this environment. Just how Kerala has shown successful people's movements to the entire world to follow (like literacy movement) Kerala should now gear up for yet another people's movement aiming at bringing about an environmentally and economically sustainable model of waste management. Kerala can show the world on how to manage waste if this strategy is followed.

Strategy in a nutshell.

1. Biodegradable Waste:

Biodegradable should be managed at source including home composting, roof top composting for apartment complexes, community level composting, highly decentralised small scale composting for market and other wastes (bio methanisation technologies included). Basically centralised facilities for biodegradable waste will not be sustainable in the long run and hence have to be strictly discouraged.

Technical resource persons can form Self Help Groups who act as facilitators to help maintain such treatment facilities and can be trained accordingly. Possibilities of engaging Kudumbashree, the informal recycling sector or any other entreprenuring people can be explored.

2. Non Bio Degradable Waste:

Much of the NBDW is recyclable. In order to ensure that they do not lose their recycling value they have to be handed over clean and dry by the waste generator.

A collection of dry waste alone, with a user fee charged from the waste generator, has to be initiated. The Self Help Groups can be utilised for the same. Collected dry waste has to undergo secondary segregation, which needs Material Recovery Facility to be set up.

Forward linkages for recycling (including glass, paper, metal, plastic and e waste) can be arranged which generates additional remuneration to the SHGs.

3. Recycling Industries:

As recycling is the most scientific and environment friendly way of treating the NBDW, such industries have to be promoted in a huge way using various type of incentives.

A recycling park/ eco industrial park which comprises of repairing facilities to promote reuse and resale of used items and recycling industries to recycle glass, paper, plastic, metal, e waste and convert them into new products, should be set up in and each and every district.

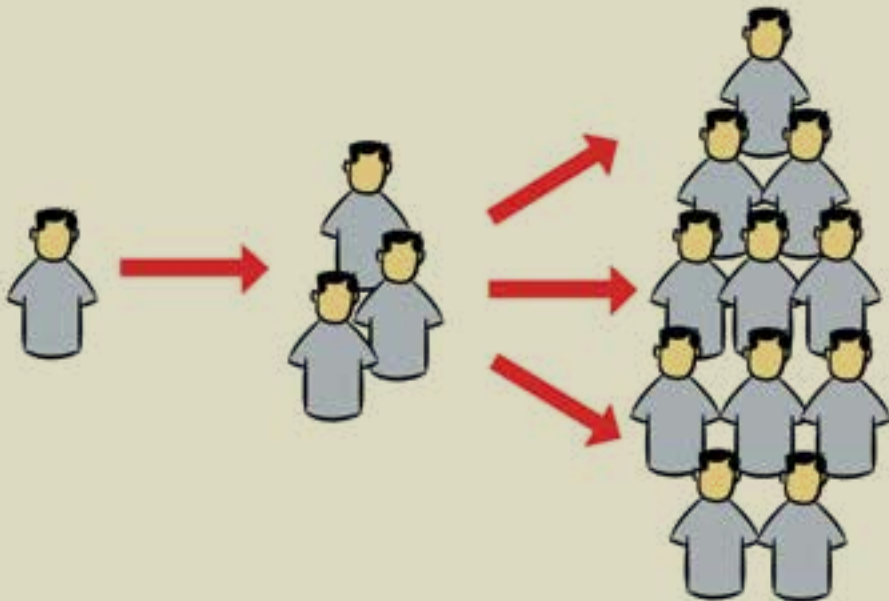
4. Sanitary waste and rejects:

A policy decision to collect sanitary waste separately and send to bio medical waste incinerators has to be taken.

Rejects and inerts have to go to a scientifically constructed Sanitary Landfill. This needs to cater to a minimum of one district and hence the state government should take up this responsibility.

The model proposed for 1,2 and 3 are envisaged as self sustaining business/ entrepreneurial models. Hence NGOs and business groups (as part of their CSR) can take up such activities in coordination with local bodies to bring in professionalism and customer satisfaction.

STANDARD OPERATING PROCEDURE FOR CAMPAIGN



Activity No 1:

Information Dissemination on the ill effects of poor waste management.

Implementation Group:

Schools and colleges, NGOs, Business Groups, media groups, RWAs, Local bodies.

As mentioned in chapter 1, waste management is a medical emergency. The list of diseases available in chapter 1 can be used and people have to be kept bombarded with these messages in order to urge them to take responsibility.

Modalities

Information can be disseminated through

- Rallies
- Door to door message delivery.
- Competitions like essay, quiz, skits, etc.
- Newspaper articles.
- Street plays, other art and folk forms.
- Any other creative ways.

Activity No 2: Motivating People to take up home composting.

Implementation Groups: Schools and colleges, NGOs, Business Groups, RWAs, media groups, Local bodies.

People should be motivated to take up Source Level Treatment of Biodegradable waste.(list of service providers who sell such units are available on the mission's website.)

- A club for composters can be formed especially among students. The club should be formed at the local body level with teachers and environmentalists in the village/town/city. Schools, colleges and other welfare organisations can be member groups or sub groups. Volunteers will have to get registered and registered volunteers will be periodically monitored by the members of the club , for the number of cycles they compost and will be awarded a badge or other tokens of appreciation as a proud member of the club depending on the number of cycles they compost. (one cycle takes an average of one and a half months.) this registry will also be a record of the number of people who regularly compost.

- **Motivation can be done through**
 - Rallies
 - Door to door message delivery.
 - Competitions like essay, quiz, skits, etc.
 - Newspaper articles.
 - Street plays, other art and folk forms.
 - Any other creative ways.

Activity No 3: Swap Shops.

Implementation Groups: Schools and colleges, NGOs, Business Groups, RWAs, media groups, Local bodies.

Swap shops mentioned in chapter 4: either as a periodic or everyday affair can be organised in schools, colonies, institutions, etc.

Activity No 4: Dry Waste Collection Programs.

Implementation Groups: Schools and colleges, NGOs, Business Groups, RWAs, media groups, Local bodies.

Nearby scrap dealer can be identified (list available on the missions's website.) and according to the materials he takes collection programs can be undertaken at schools, colleges, colonies, institutions, etc. Small and mini MRFs can be established at schools and other places for temporary storage. (a small room would be sufficient).

Activity No 5: Implementation of Green Protocol:

SOP available on the mission's website and annexure).

Implementation Groups: Schools and colleges, NGOs, Business Groups, RWAs, media groups, Local bodies.

Either on everyday basis, or while organising events, a complete ban on disposables can be observed.

Activity No 6: Kathu changes garbage dump to garden:

Implementation Groups: Schools and colleges, NGOs, Business Groups, RWAs, media groups, Local bodies.

Dump sites in your locality can be chosen. After wearing adequate protection get your hands dirty, remove the garbage from the dump, segregate into organic and inorganic. Organic matter can be put in grow bags and used for growing ornamental

plants (only). The inorganic recyclables can be washed in water and given away for recycling. All that cannot be salvaged will have to be disposed once and for all and the dump sites can be painted and given a new look. The local population should take responsibility to maintain the converted dump site and prevent any further dumping. This is inspired by Dirty Indians only with a modification of our own. Videos could be seen in the link <https://www.youtube.com/watch?v=tf1VA5jqmRo>

The following can be achieved due to this activity

1. Local communities can be brought together for a common cause and could be motivated.
2. Community ownership of their neighbourhood with a collective thought of “My Neighbourhood My responsibility” can be brought about.
3. The Broken Window Syndrome and the Tragedy of commons mechanism of a dump site can be broken. (It just means that only as a place is dirty people have a tendency to dump and dirty it even more. A beautiful site will not invite dumping.)
4. People can be educated on the importance of segregation with a hands on experience

All the above activities are not an end itself. But a beginning to an end. This is not to convey that only people should do this and government will have no role. But such activities will encourage and create positive social pressure on the local bodies to come up with more permanent structures and systems. Such activities create the public demand needed for systems to be created. Such activities are like preparing the soil before sowing to reap a rich harvest. They are the first and essential basic step to be taken up for successful waste management systems.

CONCLUSIONARY REMARKS



“

It is better to pay a tiny bit of our time and energy to the environment rather than our precious health.

”

The approach conveyed in this book, is a collation of the best of approaches from multiple sources. As already mentioned this is highly customised and tailor made for Kerala conditions with due consideration to the strengths as well as challenges in the society of Kerala.

Now one can say that this strategy is throwing too much burden on the citizens demanding them to compost at home, then clean and dry the dry waste and even pay for its collection and that nobody has the time or the energy.

All that can be said is that we have been throwing too much burden on the environment and environment is making us pay with our health. It is better to pay a tiny bit of our time and energy to the environment rather than our precious health.

Above all, we do not have any other workable choice. If it were it would have worked by now. The mission is not claiming that implementing this strategy would be a cake walk. There will be challenges, setbacks, and may be failures too. But they should be looked at as learnings and allow us to fine tune the strategy rather than discounting the strategy.

One of the main challenge in waste management in Kerala is that multiple messages bombard the citizens, ultimately leading to confusion. This book is an effort to convey with clarity, why some of those messages are wrong. Kerala, with the formation of the mission gave some of the best directions to proceed. But off late the sector of waste management has become a sort of a “gold rush”, where investors and business entities through the sector each claiming their technology to be the best and it is the future of waste management solutions. This book is an effort to bring some sanity in this chaos.

The mission wants to conclude by saying that Waste Management, rather this should be the last time we call this sector as waste management. High time to switch over to the term Sustainable Management of Resources which will give an overarching view bringing in multiple departments including

- Agriculture and allied sectors, (linking bio waste management with organic farming)
- Industries (to promote recycling industries),
- Environment and forests (to frame environment friendly policies, standards and also monitor them),
- Health (as they play a huge role in awareness generation and enforcement),
- Tourism (as they are not only the worst affected but also the waste this industry generates is a very big challenge)

- Revenue (for land identification and possible acquisition)
- Finance and Taxes (to create financial instruments that discourage environmentally degrading materials, and also strongly incentivise design change, Extended Producer Responsibility, recycling, etc and above all to introduce mechanisms to enforce allotment towards environmental costs into every infrastructure projects,)
- Social Justice Department (as essentially much of waste management is a social project and they have a huge role in providing insurance and other securities to formalise the informal sector) and above all
- Education Department so that responsible waste management practices is included in the curriculum that will enable us in catching them young and grooming them into responsible citizens of the future.

This level of interdepartmental and intersectoral coordination is the way forward for sustainable management of resources. No longer can it be the sole responsibility of LSGD.

Not many of us are groomed to be an environmentalist including almost all in the mission. If you say you are an environmentalist you are deemed anti developmental and anti businesses. As a matter of fact it has become a popular opinion that development and environment / business and environment cannot go hand in hand, which is a very false thinking. Actually there can never be development without environment. Above all the strategies mentioned here are how business models can sustain environment, ***how technologies can sustain environment provided there is a vision for a change and that the change is towards an alternative design in our lives and in our systems.***

Therefore what is required is for all of us to become a change agent, all of us to become environmentalists, not essentially like the ones who chain themselves to trees, but in a minimal way by managing our waste responsibly.

Be the change you wish to see
in the world....
Be a responsible parent....
Be an environmentalist.