A Study between the Conventional Waste Management and Latest Waste Management Techniques in Developed & Developing Countries, Its Scope and Challenges in the Developing Countries

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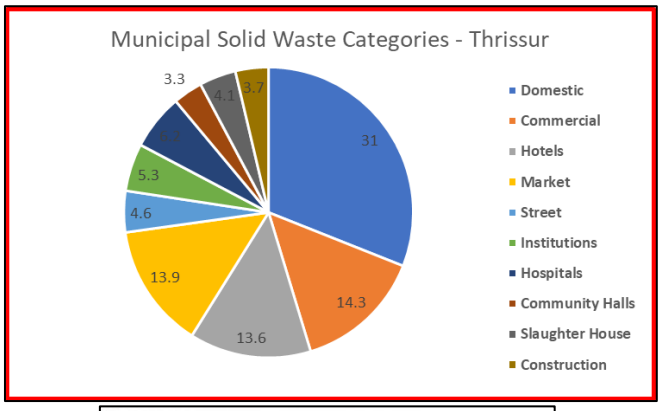
Abstract— The planet is at the mid of a threat due to the waste generated by human beings all around the world. The production of an increasing quantity and complexity of wastes pose a serious question to the future of the planet. The estimated quantity of only Municipal Solid Waste (MSW) generated worldwide is around 2 billion metric tons. In many cases, municipal wastes are not well managed in developing countries, as cities and municipalities cannot cope with the accelerated pace of waste production. Waste collection rates are often lower than 70 per cent in low-income countries. More than 50 per cent of the collected waste is often disposed of through uncontrolled landfilling and about 15 percent is processed through unsafe and informal recycling. Electronic waste (e-waste) is also one of the fastest-growing pollution problems worldwide given the presence of a variety of toxic substances which can contaminate the environment and threaten human health, if disposal protocols are not well managed. The key to success in terms of waste management is to develop eco-design devices, properly collect waste, recover and recycle material by safe methods, dispose of waste by suitable techniques, forbid the transfer of waste to developing countries, and raise awareness of the impact of waste. No single tool is adequate but together they can complement each other to solve this issue.

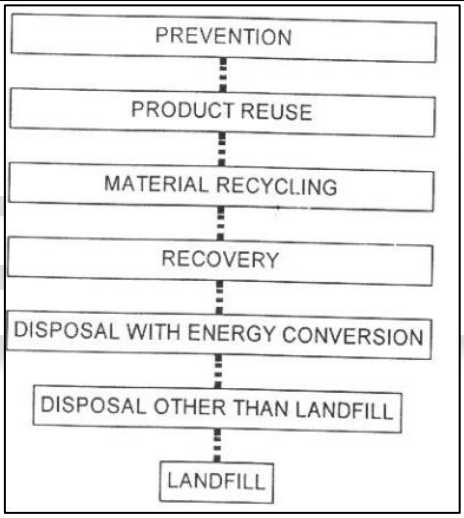
Key words: Solid Waste Management, Treatment, Segregation, Recycling

I. INTRODUCTION

One of the biggest threat for sustainable development in today's world is uncontrolled Waste Generation and its improper handling. The rate at which the environment is polluted is alarming and the consequences are already visible in many parts of the world. There are lot of conventions, conferences happening all around the world on waste, waste management, recycling, handling of waste, hazardous waste etc. like "The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal was adopted on 22 March 1989 by the Conference of Plenipotentiaries in Basel, Switzerland", The International Conference on Waste Management and Technology, Earth summit in Rio, Brazil in 1992 (Planning Commission, 1995) etc

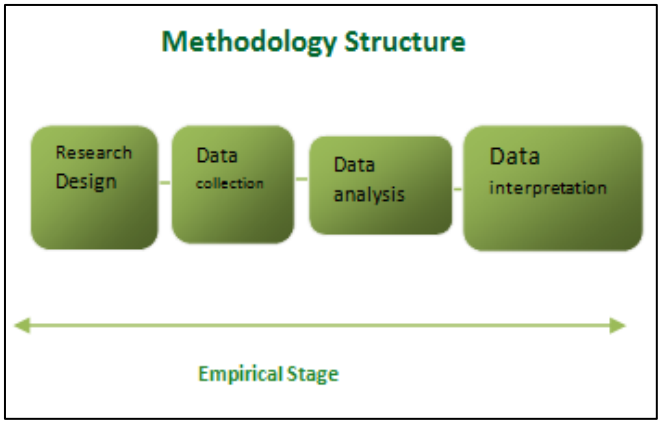
This project aims at a study between the conventional waste management and latest waste management techniques, its scope and challenges in the developing countries. The data is collected from villages in Trissur district, Kerala and cities in Kuwait.





II. METHODOLOGY

A. Research Methodology



B. Data Collection - Sampling Audits

Audits checklist is developed and audits will be undertaken in selected municipalities and corporation in Kerala. Audit

shall include identification of conventional methods for handling waste, cost involved and difficulties. Statistical representations will be made. Audits will be done in Kuwait also on the same

C. Type of Sampling

The parent population for a waste analysis campaign is the whole quantity of residual household waste and/or residual co-collected commercial waste, which may be sampled from and subsequently analyzed. This may encompass the whole area of a municipality or a defined part of a municipality although the former will generally be the case in order to obtain waste analysis results, which are representative of the whole area under investigation. A sample refers to a subset of the parent population and it is necessary to work with waste samples because it is not possible to analyses the whole population of waste for the area under investigation.

D. Recommendation

It is recommended that stratified random sampling should be used, where possible, as the basis for sample selection for a local or regional waste analysis program. Whatever strata are chosen it is crucial that the relevant sources of waste to be sampled from, such as the waste bins, are capable of being attributed to, and sampled according to, the chosen strata.

E. Data Analysis

Cost incurred in the different stages of conventional waste management will be compared with latest technological waste management system available in Kerala and Kuwait

A large number of factors may influence the composition or the amount of waste to be analyzed and these may in turn vary in effect between municipalities; examples include:

- Residential structure
- Heating systems
- Seasonal variations
- Bin size
- Availability of civic amenity sites
- Holiday periods
- Type of collection system (separate collection)
- Levels of public education and awareness on waste issues

F. Quantification of results

The results will be compared and quantified to arrive at economic viability and environmental impact of conventional system over new systems.

Identification of challenges faced in the conversion from conventional systems to technically advanced systems from the analysis

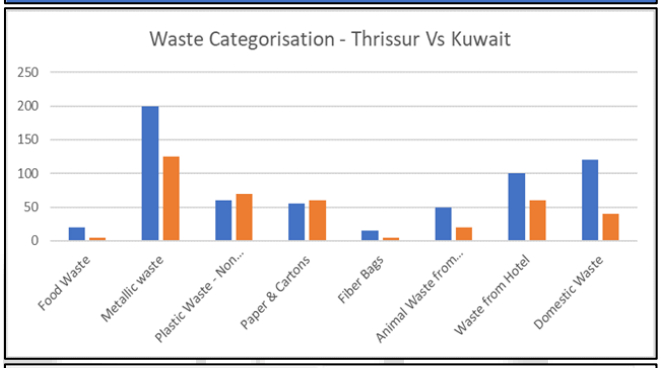
The challenges faced for the conversions will be identified and tabulated

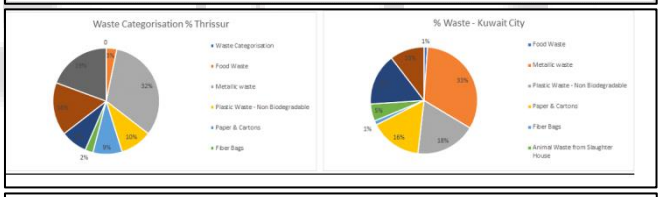
Suggestions and recommendation in implementing technically advanced and viable systems in Kerala

Study based recommendations will be provided for proper implementation of viable technically advance systems

G. Research Data Analysis & Significant Findings

	Qty/Day - tons		%	
Waste Categorization	Thrissur	Kuwait City	Thrissur	Kuwait City
Food Waste	20	4	3%	1%
Metallic waste	200	125	32%	33%
Plastic Waste - Non-Biodegradable	60	70	10%	18%
Paper & Cartons	55	60	9%	16%
Fiber Bags	15	5	2%	1%
Animal Waste from Slaughter House	50	20	8%	5%
Waste from Hotel	100	60	16%	16%
Domestic Waste	120	40	19%	10%
	620	**384**	**100%**	**100%**

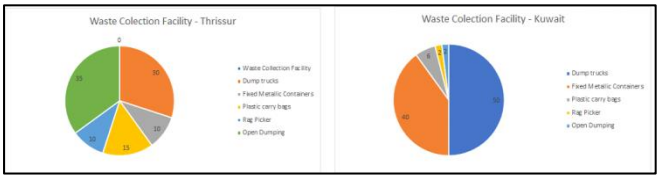




Waste Collection Facility - Comparison

	%
Waste Collection Facility	Thrissur
Dump trucks	30
Fixed Metallic Containers	10
Plastic carry bags	15
Rag Picker	10
Open Dumping	35

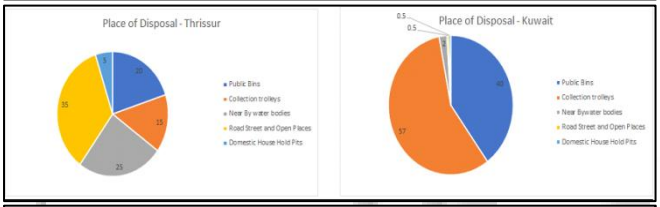
	%
Waste Collection Facility	Kuwait City
Dump trucks	50
Fixed Metallic Containers	40
Plastic carry bags	6
Rag Picker	2
Open Dumping	2



Place of Disposal

Place of Disposal	% Thrissur
Public Bins	20
Collection trolleys	15
Near By water bodies	25
Road Street and Open Places	35
Domestic House Hold Pits	5

Place of Disposal	% Kuwait
Public Bins	40
Collection trolleys	57
Near Bywater bodies	2
Road Street and Open Places	0.5
Domestic House Hold Pits	0.5



Waste Bins Availability

Availability of Waste Bins - Thrissur	%
Available	32
Not Available	68

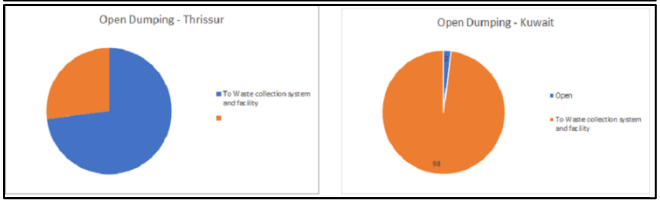
Availability of Waste Bins - Kuwait	%
Available	98
Not Available	2

Analysis of Waste Treatment

No treatment – Open Dumping

Waste dumped openly on land - Thrissur	%
Open	73
To Waste collection system and facility	27

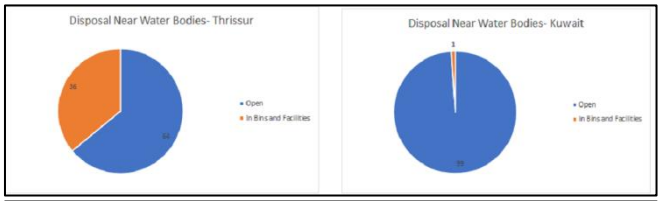
Waste dumped openly on land - Kuwait	%
Open	2
To Waste collection system and facility	98



Disposal to Water Bodies Without Treatment

Waste Disposal Near Water Bodies - Thrissur	%
Open	64
In Bins and Facilities	36

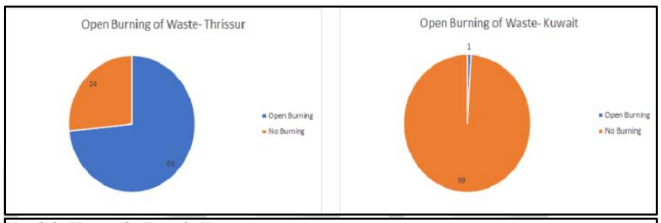
Waste Disposal Near Water Bodies - Kuwait	%
Open	99
In Bins and Facilities	1



Open Burning

Open Burning of Waste - Thrissur	%
Open Burning	66
No Burning	24

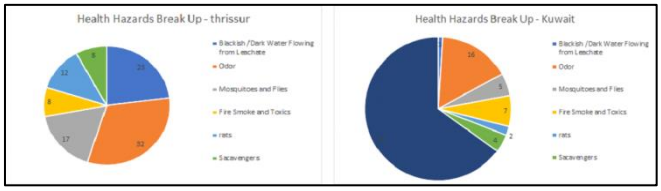
Open Burning of Waste - Kuwait	%
Open Burning	1
No Burning	99



Health Hazards Break Up

Health Hazards Break Up - Thrissur	%
Blackish /Dark Water Flowing from Leachate	23
Odor	32
Mosquitoes and Flies	17
Fire Smoke and Toxics	8
Rats	12
Scavengers	8

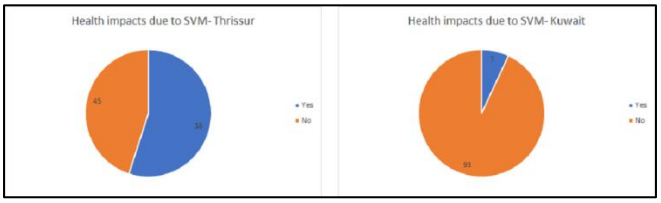
Health Hazards Break Up - Kuwait	%
Blackish /Dark Water Flowing from Leachate	1
Odor	16
Mosquitoes and Flies	5
Fire Smoke and Toxics	7
rats	2
Sacavengers	4
Hazard Free	65



Health Impacts of Solid Waste Management

Health impacts due to SWM - Thrissur	%
Yes	55
No	45

Health impacts due to SWM - Kuwait	%
Yes	7
No	93



III. SIGNIFICANT FINDINGS

A. Waste generation, storage and Primary disposal practices

Most of the SW generated in households and business places are organic waste. All together 59% of households and 61% of business places discarded organic waste. However, there were issues with waste storage and primary disposal practices. Most of the Households and business places do not have proper waste containers to store their waste. The plastic bag usage as a waste container is higher. 42% of the households and 36 % of the business places use plastic bags while others use different containers. Additionally, there are improper primary waste disposal practices due to the lack of public waste bins supplied by TMC. The community; 77% of Households and 91 % of Business Places empty their SW daily. Thus, the survey established that about 96% of households and 83% of business places do not have access to public waste bins to dispose their SW. This implies that respondents resorted to dumping waste in unauthorized places nearby water bodies, by roadsides, open spaces and other unauthorized ways of managing their domestic waste.,

B. Solid Waste collection process by TMC

There are irregular or lack of routine collections of waste by TMC. The most significant issue here is that 61% of households and 51% of business places have no waste collection process within the study area. Most of the waste management issues are identified due to lack of waste collection process for many sectors. Especially, in the areas which were newly added to Municipal authority when it changed from urban authority to municipality have no waste collection process by TMC. This has considerably affected the incensement of unauthorized primary waste disposal practices. Furthermore, satisfaction of the community about waste collection process is low in TMC. 75 % of householders are not satisfied with the solid waste collection process by TMC. Comparing to households the business places are satisfied with the process as most of them are established in town areas. The waste transportation also is identified as problematic due to waste spillage from the uncovered waste tractors.

Moreover, the landfill site has not met the requirement of a sanitary landfill and therefore could be described as an open dump. Though the landfill had a recycling process and a composting process; they are not functioning well. There were no adequate waste separation processes before final disposal. This led to the burying of some valuable resources such as organic foods (for composting) and plastic (for recycling), in the landfill which could have been otherwise reused. The lack of facilities, equipment and workers, is the challenge for a proper final disposal process. The landfill site too had no access to three phases' electricity and water for proper SWM process. And therefore, the concept of integrated waste management is almost missing. Consequently, the absence of municipal waste management plans is an important aspect of the current situation in the area with new development processes. Moreover, the Waste issues are not considered from the economic perspectives. Absence of the capacity to articulate the environmental issues in the economic reform is significant.

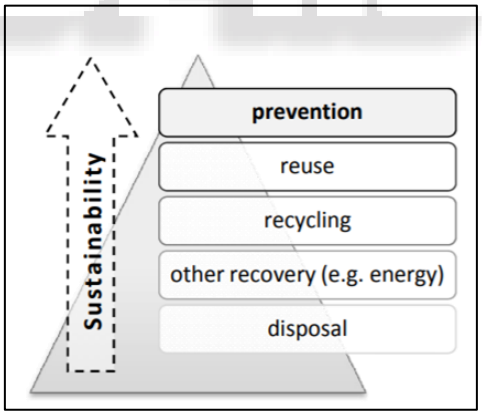
C. Waste separation and recycling and treatment

The research finding indicates that the large proportion of the community is ready to separate waste with a proper waste management process. Among the households, 81% of the respondents and 63% of business persons are strongly willing to separate different types of waste. Further research concerning the issue revealed that the residents are willing to participate in council initiatives and cooperate with the council in order to have better SWM facilities. A proper recycling and treatment of waste as well as a clear and specific activities by municipalities aimed at promoting recycling processes within households is highly lacking in the study area. However, most of the community members who heard about the importance of recycling agree to recycling process. As a percentage, 75% of householders and 72% of business persons agree to recycling process.

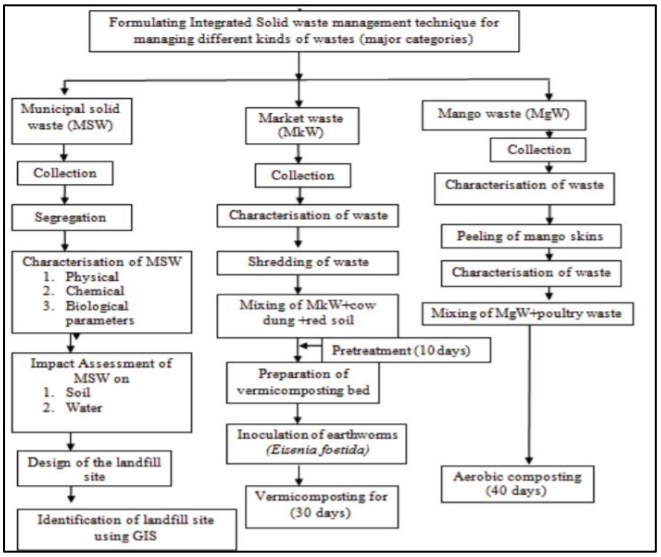
IV. RECOMMENDATIONS

A. Waste Management in Thrissur – Improvement Recommendations

1) Solid Waste Management – Strategy and Hierarchy Development



Waste management practices differ for developed and developing nations, for urban and rural areas, and for residential and industrial producers. Waste management and waste reduction programmes have been shown to reduce operating costs for many industries.



Every item we use is derived from a raw material of one form or another. It is processed, packed, transported, used and thrown away. Each step in the process uses a huge amount of energy most of which comes from fossil fuel power stations generating electricity. Industry also uses a huge amount of water in the production of all our goods which comes from energy intensive water processing and desalination plants. The production of all our household and industrial goods has inherent costs; financially and to the environment.

Reducing our usage of materials saves money and reduces our depletion of natural resources.

Waste Management can be broken down into the following:

B. Reduce, Reuse & Recycle

1) Reduce

Using less of any product than is necessary; finding ways to economise. Improved care and maintenance reduces breakages and breakdowns.

- Use both sides of paper when photocopying or printing
- Use ceramic cups and mugs and plates not disposable ones
- Good maintenance of tools and good planning reduce off-cuts and defects
- Use good stock rotation and inventory control so that items never go out of date before they are used up.
- Reducing the amount of waste, we produce has one simple effect: reducing the amount we have to transport and process. This has immediate energy, fuel, vehicle wear, employment and environmental savings.

2) Re-Use

Promote the use of reusable rather than disposable items. The savings here are obvious less raw material usage and less overall waste produced. The initial costs are higher but long-term costs are less.

- Maintain and repair rather than throw away
- Use the blank side of printed paper for making notes, etc.
- Buy refillable toner cartridges
- Some suppliers will take back their own packaging for re-use.

3) Recycle

Many items can be recycled and the raw materials used again, this includes all metals, paper, glass and plastics. Many 'waste' products still have a residual value, especially metal like copper. Recycling any scrap metal has financial and environmental benefits. The recycling of plastics and paper has a much smaller financial gain but prevents these wastes accumulating in the environment. Plastic is non-biodegradable and will not degrade for decades after it was discarded. Items we can recycle include:

- Glass
- Aluminium Cans
- Wood
- Plastics
- Any Scrap Metal
- Card and Paper
- Oils
- Textiles
- Some Paints and Chemicals

To promote recycling, it is important to segregate waste into recyclable and non-recyclable bins. Separate glass from paper and plastics. Non-recyclable waste such as food leftovers are also separated to promote the recycling of other waste.

The above are known as 'The three Rs'

Work sites also produce a large amount of what is considered potentially hazardous waste.

Such items include but are not limited to; batteries, chemical containers, paint and thinners containers, used oil and fuel filters, coolant, solvents, pipe dope, used hydraulic fluid and engine oils, drilling mud, grease and other items.

Many of these items contain recyclable materials and need to be stored, transported safely.

At any site there is a storage area put aside, away from the work area, specifically for these types of object. There are waste oil containers for the storage, removal and recycling of any waste oil generated. There are also bins for the segregation of hazardous and non-hazardous waste. Any bins for hazardous waste will be clearly marked. Employees will be informed of the materials which are to be placed in these bins.

Managing and recycling hazardous wastes is time consuming and costly. In many cases it is possible to substitute certain chemicals with less hazardous alternatives. Product substitution is a very effective way to reduce hazardous waste production.

V. REASONS FOR MANAGING WASTE

Over the last 20 years the environmental impact of activities has been highlighted more and more. There are many benefits to companies who operate in a cleaner, more environmentally friendly way.

A. Profit

The most obvious result of a good waste management programme is improved profitability, which always pleases owners and shareholders. Profit can be improved by:

1) Reducing waste
2) Improving the efficiency of resource usage

3) Attracting customers and investors (good environmental credentials)
4) More favourable insurance premiums due to segregation and separation of potentially hazardous wastes
5) Tax breaks and government concessions

B. Compliance

Operating within the law with regards to waste and pollution

- Reduces potential for injury and long-term health effects. (also increasing profit)
- Avoids fines or even imprisonment for negligent behaviour
- Can increase job security

C. Good Employer

Companies that utilise effective environmental and waste management programmes improve the working conditions by reducing noise and air pollution where possible. The overall appearance of a site improves, raising morale and relations with the wider community.

Good housekeeping and waste management are site disciplines that work together to provide a safe working environment for employees and the land where they work alike.

VI. Revenue from Recyclables

Below are some of the Building materials made entirely from waste products

A. Newspaper Wood

This design comes from Norway, where over 1m tons of paper and cardboard are recycled every year. The wood is created by rolling up paper and solvent-free glue to create something not dissimilar to a log, then chopping it into usable planks. The wood can then be sealed so it's waterproof and flame-retardant, and used to build anything you would normally build with wood.

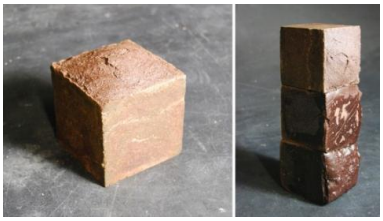
B. Nappy roofing

It's good news that something can be salvaged from all those nappies and sanitary products we throw away, even though they are well really gross. Special recycling plants separate out the polymers from the organic waste, and these polymers can then be used to create fiber-based construction materials like the tiles in the image above.

C. Recy blocks

These colorful bricks are made from old plastic bags, which are notoriously difficult to recycle in any other way. Recycled bags or plastic packaging are placed in a heat mold, and forced together to form the blocks. They're too lightweight to act as load-bearing walls, but can be used to divide up rooms or outdoor areas.

D. Blood Brick



This idea rests on the assumption that animal blood counts as a waste product. This, we realize, is a potentially offensive idea – but while carnivores are still munching away, they're still wasting loads of animal blood, especially in societies without industrialized food production systems. And, as it turns out, blood is one of the strongest bio-adhesives out there, as it contains high levels of protein.

E. Bottle bricks

This proposal is a little different, as it relies on producing a consumer good specifically so it can later be used as a building material. Lots of companies now make bottles in cuboid or other tessellate shapes, to make them easier to transport.

But the practice of doing so to create construction materials actually started with beer company Heineken in the 1960s – Alfred Henry Heineken, owner of the brewery, visited a Caribbean island and was dismayed at both lack of shelter, and the number of discarded Heineken bottles scattered everywhere. So the company landed on a new, brick-shaped design for the bottle, shown in the images above. The bottleneck slots into the base of the next bottle, forming an interlocking line.

F. Mushroom walls

Here, designers figured out a way to grow wall insulator and packing materials using mycelium, bacteria found in rotting organisms like tree trunks and agricultural byproducts. If placed in a mold, these organic matters grow to the desired shape within a couple of days, and can then be stopped using a hot oven. This is particularly useful because traditional insulating and packing materials tend to be non-biodegradable, or, in the case of asbestos, poisonous.

G. Plasphalt Roads

Plasphalt Road is made up of grains of plastic produced from unsorted plastic waste, which replaces the sand and gravel traditionally used in asphalt production. In testing, it was found that plasphalt roads were far less vulnerable to wear and tear than traditional asphalt, because the asphalt emulsion bonded better with the plastic than with gravel or sand.

H. Wine cork panels

These wall or floor tiles are made by combining recycled granulated cork with whole wine corks, which you can see as those oblong shapes in the tiles above. This is a pretty useful idea, considering the world apparently consumes around 31.7bn bottles of wine a year.

I. Roof and wall tiles

These roofing tiles are made from recycled materials such as plastics from industry, and rubber from tires into disuse. In this way, this technology contributes in the decontamination of the environment, since it uses waste materials that are buried in municipal land without any use, or accumulated and burned in landfills, causing pollution. The procedure used was the thermo-molding compaction. The available amounts of plastic waste are abundant.

VII. Conclusion

Based on the study these are the final findings and conclusion:

People shall be educated and encouraged to reduce, reuse and recycle

- The seriousness implications of waste disposal need to be conveyed to the public
- Household waste treatment shall be made mandatory
- Onsite treatment and utilization will reduce need for transport.
- Special attentions need to be given for all kinds of plastic waste
- Strict regulations should be implemented for plastic wastes
- Subsidy on products generated from recycled materials will encourage socio-economic changes.
- Centers with technologies that use collected waste materials are needed.
- Wastes that have severe risks and excessive problems in disposal should be identified and those which cannot be neutralized may need to be restricted at the point of creation or entry.
- Government authorities shall be more serious about this upcoming threat of waste.

There is a huge potential of revenue from the waste which is not yet explored in India

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