



## A REVIEW ON ECONOMICAL SANITATION SOLUTION FOR COMMUNITY

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**Abstract:** This paper aims to provide alternative solution for community toilets in slum areas. As existing community toilets are having constructed by traditional process which is time consuming and costly so to reduce cost, time, men power & machineries alternate solution is required so this paper mainly works on plastic made toilets for slums, as reuse of plastic is now a day's used in construction industries like for road construction so this should be used in toilet construction which will help to reduce cost and time.

**Keywords-**Alternate solution for sanitation, reduction in construction cost, economical sanitation

### I. INTRODUCTION

Indian government had constructed community toilets in slum areas for slum users which were aimed to reduce open defecation. This toilet requires much money due to traditional construction method also it requires much time for construction and in real sense it doesn't require much more investment.

Community toilets are necessary but it should be less costly and sustainable. So now a day's pollution due to plastic is major issue and it will not decrease until we start it recycling and reusing for various aspects, so use of plastic for toilet construction is a great alternate solution over traditional toilet due to economical aspect.

As per plastic properties, it is never get damaged due to water and waste so it can become durable and long life structure for community toilets. Existing toilets requires more maintenance cost due to damage by water so plastic made toilets are effective. Plastic is used in various construction activities and it gives good results also so it is necessary to recycle and reuse. Also plastic pollution is harmful for environment and it is increasing day by day and it is non-disposable so it will be there for long life and due to changed living activity plastic pollution is increasing day by day, government have taken actions against plastic but in some portion use of plastic is mandatory so this plastic recycling help to reduce plastic pollution.



Fig.1Community Toilet

A view of community toilet is shown in fig.1 which shows traditionally constructed toilet for users and as per current market rate it requires much money so it becomes more costly so instead of this an economical solution over traditional toilets is required.

### A. Problem statement

Traditional method of toilet construction requires more money and there is no such model which makes these slum toilets sustainable. Also reuse of plastic for construction work is necessary which will help to reduce plastic from environment which will reduce pollution due to plastic. Also construction by conventional method requires more Men power, Money and Machineries and most important factor is

time required for construction. So to reduce men power, money, machineries and time of construction low cost and easy to install toilet model is required.

## B. Objectives

- To work on smart low cost and sustainable toilet model.
- To reduce time span of construction.
- To reduce plastic pollution by reusing it in construction.

## II. LITERATURE SURVEY

“New test method to determine effect of recycled materials on corrugated HDPE pipe performance as project by rate process method”<sup>[1]</sup> Dr.Gene Palermo, Patric Vibien et.al

In this paper authors have worked on checking of effect of recycled material on corrugated HDPE material. For this test they have developed a ring test in which both materials have formatted into ring shape and test is carried out on that ring by applying internal pressure and on high temperature. This method is effective to check behavior of both virgin and recycled HDPE resin under pressure and it is tested for bending and deflection of material.

“Improvement of tensile properties of recycled low density polyethylene by incorporation of calcium carbonate particles”<sup>[2]</sup> Dr.Raed Ma’ali et.al

Authors have worked on behavior of Low density polyethylene material after recycling process. For this research they have tested virgin LDPE and recycled LDPE material and noted down results of change in mechanical properties of both materials. After test they found that recycled LDPE material loses tensile strength so to increase tensile strength they have added calcium carbonate into LDPE material and it found to be increase in tensile strength after recycling process.

“Perceptions and attitude towards Eco-Toilet system in Rural Areas: A Case study of Philippines (2018)”<sup>[3]</sup> Jonthan J Ignacio etc. They have worked on sustainable development goal to reduce poor sanitation under which it has designed ETS “Eco toilet system” which is focuses on less use of water or waterless. Also toilet pan is redesigned so it can recover nutrients from waste by collecting urine and feces separately to prepare fertilizer. By selling this fertilizer they have generated revenue and made this model sustainable.

“Mechanical properties and molecular structures of virgin and recycled HDPE polymers used in gravity sewer system”<sup>[4]</sup>2019. Mathias Alzerreca et.al

This research paper is aims to make comparison between virgin HDPE material and recycled HDPE material. By using various techniques and test authors have researched on changes in properties of HDPE material. Authors have use Mechanical testing method, C solid state NMR Test, Melt flow index test etc. This all tests were conducted on HDPE pipes. For this test 5 sets of material is collected

- 1 Virgin HDPE material – High quality HDPE like pipes
- 2 HDPE-R- Effective and damaged products
- 3 HDPE-M- Mixture of Virgin HDPE and damaged HDPE material
- 4 HDPE-P-Household products

Testing on above 4 categories material is concluded that recycling process decreases tensile strength of material but it increases plasticity.

“Economic and Green house gases Emission analysis of Implementing Sustainable Measures in existing Public buildings”<sup>[5]</sup> Moatassem Abdllah & Khaled El-Rayes.

They have focused on cost reduction in maintenance of toilet. Water uses is paid system like payment is done as per user reading so authors have designed system in which each toilet have water sensors which keeps control on water uses like for flushing, cleaning purpose. Reduction in wastage of water is actual necessary. also they have worked on HVAC system in public toilets so it can reduces excess use of energy and through which government can save excess money investment.

“Toilet Revolution in China (2017)”<sup>[6]</sup> Shikun Zeng, Zifu Li, etc.

In this paper authors have worked on reasons for open defecation under which they found that current condition of toilet is poor and due to no revenue it is suffering from lack of maintenance. So China took help from Bil & Melinda foundation to start revolution in toilets and it was Public private partnership so government can get free from funds collection for toilets in slum as well as for maintenance of this toilets.

“Public Toilet wastewater treatment system using Forward Osmosis (2016)”<sup>[7]</sup> Yangyu Xu, &Qibo Jia.

This paper mainly focuses on forward osmosis system (FOS) which concept is used to prepare fertilizer from toilet waste (by using urine and feces) In this forward osmosis method urine is stored in a collector tank under process which reduces water content from urine and remaining content is useful for agricultural purpose. Basically this project works on generation of revenue from fertilizers

“Composting Toilet for sustainable water management (2015)”<sup>[8]</sup> Naoyuki Funamizu & Miguel Angel Lopez Zavala

In this research paper work is done on preparation of compost from waste by using bio-degradation method which is useful for agricultural use and which generates revenue.

“Public Toilets: An Exploratory study on the demands, needs and expectations in Turkey (2015)”<sup>[9]</sup> Yasemin Afcan & Melten O Gurel.

This research is based on changes in design of community and public toilet for which they have audited 50 toilets in details and they found that some content of toilet is extra and costs more so they made changes in toilet seat, toilet block, toilet pan, and door. This will reduce construction cost and maintenance cost.

“Sanitation in Slums of Mumbai- View from the Field (August 2014)/CEPT University” <sup>[10]</sup> Meera Mehata & Dinesh Mehata.

Authors have worked in slums of Mumbai for audit work of community toilet and from this report they have calculated cost required for maintenance of these slum toilets. Main aim of this study is to know total cost required for this slum toilet and amount of revenue generation from this toilet.

“Toilet access among the urban poor – challenges and concerns in Bangalore city slums/isbn 978-81-7791-239-5” <sup>[11]</sup> S.Mansi & N. Latha.

In this paper author have worked in Slums of Bangalore city for poor sanitation and water supply system, they have collected all the data from slums and concluded that necessity of more slum toilets is necessary for which government should prepare smart model which will focuses on sustainable development.

“Assessment of Appropriate Sanitation Technologies in a Development Context- Case Study: Tangkae, Timor-Leste (2006)” <sup>[12]</sup> Phoebe Mac.

Author has taken a case study in Tangkae a small village for slum sanitation development and revenue generation. Main source of revenue is composting and urine diversion technique for which he designed ventilation improved pit latrine so it requires less water and compost can be prepared from waste.

“Towards Sustainable sanitation in slum areas- A field study in Mumbai (2013)”<sup>[13]</sup> Emma Larsson & Maja Nilsson.

This paper have main approach to implement sustainable sanitation in slum areas & this study was done in Slums of Mumbai to know the requirement of users so users can pay fees for toilet use. So this fees collection from slums can make toilet sustainable but it concluded that present condition of toilets is very bad and it is requires proper maintenance and good drainage system if this all facilities will be available then users are ready to pay a fees decided by government.

### III. CONCLUSION

As per research on sanitation area suggests that current condition of toilet is need to be changed by all the ways like cleaning, maintenance and structure so to reduce extra investment of money on maintenance part there is permanent and low cost toilet model is necessary. So to overcome this issue recycled high grade plastic made toilet structure is needed and it will approach to economic sanitation solution for slums & we know plastic is durable and have long life so plastic made toilets model will definitely reduce cost of maintenance and replacement.

### REFERENCES

1. Dr.Gene Palermo, Patric Vibien et.al “New test method to determine effect of recycled materials on corrugated HDPE pipe performance as project by rate process method”
2. Dr.Raed Ma’ali et.al “Improvement of tensile properties of recycled low density polyethylene by incorporation of calcium carbonate particles” (2018) volume-8 Pg.No.195-200
3. Emma Larsson & Maja Nilsson, “Towards Sustainable sanitation in slum areas- A field study in Mumbai”, (2013)
4. Jonthan J Ignacio, Roy A Malenab, “Perceptions and attitude towards Eco-Toilet system in Rural Areas: A Case study of Philippines” 20,521; doi: 10.3390,su 10020521 2018
5. Mathias Alzerreca et.al “Mechanical properties and molecular structures of virgin and recycled HDPE polymers used in gravity sewer system”2019.
- 6.Moatassem Abdllah,& Khaled El-Rayes, “Economic and GHG Emission analysis of Implementing Sustainable Measures in Existing Public building"s”, M.ASCE Library
7. Meera Mehata & Dinesh Mehata, “Sanitation in Slums of Mumbai- View from the Field”CEPT University, August 2014
8. Naoyuki Funamizu,, Miguel Angel & Lopez Zavala, “Composting Toilet for sustainable water management” M.ASCE Library, 2015
9. Phoebe Mac, “Assessment of Appropriate Sanitation Technologies in a Development Context-Case Study: Tangkae, Timor-Leste” (2006)
10. Shikun Zeng, Zifu Li, Sayed Mohammad, et.al,”Toilet Revolution in China, Journal of Environmental Management 216 p.no 347-356, 2018
11. S.Mansi & N. Latha, “Toilet access among the urban poor – Challenges and concerns in Bangalore city slums”,ISBN 978-81-7791-239-5

12. Yangyu Xu, & Qibo Jia, "Public Toilet wastewater treatment system using Forward Osmosis", M.ASCE Library, 2016

13. Yasemin Afcan, & Melten O Gurel, "Public Toilets: An Exploratory study on the demands, needs and expectations in Turkey", *Environment and Planning B: Planning and Design* 2015, volume 42, pages 242 – 262, 2015.

