

## Impact of Municipal Solid Waste in State of Himachal Pradesh

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### Abstract

Waste is a one of the major health hazard that undermines people right to a safe line. Different forms of waste if not treated and disposed carefully results in causing and damaging environment badly. MSW is governed by MSWR in India, maximum of urban local bodies do not have appropriate plans for execution and enactment of MSWR. Solid waste management is the mandatory function of urban municipal bodies but it is considered to be least important function. China have large magnitude in total waste generation because of three prime factors: Urbanization, population growth and industrialization. China still has far to go in the administration of strong waste regarding strong waste reusing, treatment innovation and administration technique when contrasted and numerous more created nations, e.g., Germany, Sweden, Japan, and the United States.

**Keywords:** Waste; Health Hazard; MSWR; Urbanization; Population; Industrialization.

### Introduction

Solid waste refers to any garbage, refuse, sludge from a waste water treatment plant. It contains organic as well as inorganic matters, which are produced by various activities of the society. Solid waste referred as a non liquid material that no longer has value to the person who is responsible for the generation of the product. With the increase population and urbanization problem of solid waste management has been increased and thus results in various health diseases, pollution, as well as land degradation.

Solid waste management is the mandatory function of urban municipal bodies but it is considered to be least important function (Municipal Solid Waste Management Rule-2000)

In the 21st century, the sustainable management of municipal solid waste (MSW) will get to be distinctly fundamental at all periods of effect from wanting to configuration, to operation, and to decommissioning. As a result, the range of new and existing waste treatment advances and administrative procedures has likewise crossed from keeping up natural quality at present to meet maintainability objectives later on.

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Such a deliberate advancement permits both squander administration businesses and government offices to meet normal needs of waste administration with most prominent green potential, to reuse materials out of waste streams, to amplify the renewable vitality supply, to look for all the more socially worthy choices, and to safeguard biodiversity and regular biological systems at the same time.

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To accomplish such objectives, all specialized and non-specialized parts of a solid waste management (SWM) framework ought to be broke down all in all, since they are between related with each other what's more, advancements in one region every now and again influence practices or exercises in another zone

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(UNEP, 2005) [1].

Municipal solid waste management is a critical element towards sustainable metropolitan consists of segregation, storage collection, processing, and disposal of solid waste to lower its impact on environment. (Kumar, et al, 2009) [2]. Reutilization of solid waste is not a feasible option in context of solid waste management. (Kasseva & Mbuligwe, 2000) [3].

Moreover countries like China have large magnitude in total waste generation because of three prime factors: Urbanization, population growth and industrialization. China still has far to go in the administration of strong waste regarding strong waste reusing, treatment innovation and administration technique when contrasted and numerous more created nations, e.g., Germany, Sweden, Japan, and the United States (Yuan et al., 2006) [4]. Public and private sectors of waste management are able to collect 30-50% of solid waste and they dispose it which results in harming environment of many of developing countries (Hoornweg and Thomson; 1999) [5].

MSW is governed by MSWR in India, maximum of urban local bodies do not have appropriate plans for execution and enactment of MSWR (CPCB Report-2013). 100% segregation at dwelling unit can't be claimed in India, 70% of the total waste generation is observed and remaining 30% is again mixed up and is lost in the urban environment. 12.45% waste is scientifically processed and rest is disposed in open dumps (CPCB-Report-2013). 90% of the waste is the byproducts of industrial, mining, municipal, agricultural and other processes. MSW generated per capita is estimated to increase at a rate of 1- 1.33% annually (Pappu et. al, 2007; Shekdaar, 1999) [6]. Composition and characteristics of Indian waste:

- Biodegradable Waste.
- Recyclable Waste.
- Inert Waste Matter.
- Composite Waste.
- Domestic Hazardous waste and toxic Waste.
- Hospital /Bio medical Waste.
- Industrial Waste.

#### Waste Management 4R's

*Reuse:* Items that can be repeatedly use instead of discarding or we can say which can be use again.

*Recycle:* Some of the waste can be recycled, they must be segregated and send to the appropriate plant for recycling.

*Reduce:* Some of the steps can be taken in order to reduce the some of the unnecessary wastes.

*Recover:* Sometimes production allows useful materials to be passed on as environmental waste.

Implementation of PPP Model generally occurs at ground level, when individually neither public nor private are able to achieve their goals and aspirations (Hanrahan, Srivastva & Sita, 2006) [7]. PPP mode is in nascent stage in India and 40 projects are running for different segments of MSW. With the collaboration of public and private sectors, there is increase in efficiency of urban local bodies in handling MSW. PPP mode analyzes various parameters-economical, managerial and sociological aspects.

The effectiveness of partnerships makes the mode PPP an elementary tool in MSWM (Ahmed & Ali, 2004) [8]. Waste collected in big cities is about 70-90% and whereas in small cities and towns is less than 50%. About 91% of the waste is collected formally and land filled on open lands and dumps (Kumar; 2010) [9] and 10% of the waste is burnt openly or is caught in fires in landfills, 2% of the uncollected waste is burnt openly on the streets (CPCB; 2010).

Following steps have been taken by Government of India (GOI) for solid waste management in India during the last two and half decades.

1. National waste management Committee: it emphasizes how to identify the recyclable contents in solid waste picked by rag pickers and it was constituted in 1990.
2. Strategy Paper: This paper has been developed by MoUD in collaboration with NEERI in August 1995.
3. Policy Paper- a strategy paper was prepared for the treatment of waste water, appropriate hygiene, SWM and efficacy in drainage system was prepared by Environment Engineering Institute, MoUD & Central Public Health.
4. High Power Committee: to encompass a long term strategy for SWM using appropriate technology in 1995.
5. Master plan of Municipal Solid Waste: combine efforts of MoEF, CPCB's and ULB's develop a plan for SWM with emphasis to bio-medical waste in March 1995.

Rule of SWM should be taken in such a way that ground realities and allow time for suitable processes should be developed.

Rag pickers are working for unorganized sectors, thus proper organized sectors for the reuse and

recycling of waste needs to be put in place, thus reducing the load on transportation and landfill.

**Objectives of the Project**

1. To understand the public and privatization model in solid waste management (SWM) and municipal solid waste (MSW).
2. To study the role and responsibilities handled by government bodies in state of H.P.
3. To check the feasibility and economic viability in MSW projects both in public and private sector.
4. To assess the status, challenges and opportunities in PPP in MSW/SWM in H.P.
5. To develop and build understanding PPP model.

**Research Methodology**

*Research Approach:* Quantitative

*Research Design:* Descriptive

*Research Instrument:* Survey, Interview (non-directive) and observation (non- participant)

*Scaling:* Nominal & Ordinal

*Sampling:* Non-probability sampling (convenience sampling)

*Data Collection:* Primary and Secondary

*Research Tool:* Excel (pie charts, bar-graphs)

**Research Design**

A *descriptive research design* is used in this study to describe the status of the different variable. Data was being collected for the research, analysis and synthesis of which provides the systematic information about the situation.

**Research Instrument used in This Study**

- *Survey:* A structured Questionnaire was constructed for collection of data to know the condition of solid waste in area of Himachal Pradesh. The questionnaire was designed to accomplish the objective of study. Some of the question are multi choice question and other are scored on a five point Likert scale ranging from “strongly disagree” to “strongly agree”
- *Observation (non-participant):* Data was collected by non-participant observation. In which researcher observe about the actual condition of

solid waste in area of Himachal Pradesh.

- *Interview (non-directive):* Data was also collected by non-directive interview in which open ended question was asked from retailers/ consumers, concern persons of municipal corporations in different areas which provide the information about the condition of solid waste.

*Scaling*

In this project both nominal and ordinal scale was used as in some questions only labels was given to the responses and some of the questions were scored on five point Likert scale to get the information about the importance and significance of different variables to attain main objective

*Sampling*

For the purpose of this study convenience sampling i.e. non-probability sampling was used for collecting the data by getting the questionnaire filled by the respondent. It provides easiness and quick responses from the respondent.

*Data Collection*

*Primary Data*

In this report primary data is collected by:-

- Structured questionnaire.
- Observation while interacting with customers and municipal corporation members.

*Secondary Data*

In this report secondary data is collected by:-

- From the company data given by the industry mentor
- Through internet and books.

**Results and Discussions**



Fig. 1: Framework Model

This framework model explains how four main parameters are interrelated to each other and mainly impacts the 3E (Education, Economy and Environment). Moreover it also explains how different variables impact our country and it also provides the solution and techniques through which we can control solid waste being generated by the community. Given below the graphs which mainly emphasize on the people perception on the different questions being asked to them and to learn their views regarding the municipal bodies & about their services? Sample size for the research is 100 and all the respondents are from different places from Himachal Pradesh.

**1. Is your Area (Urban/Rural) Clean and Environmental Problem Free**



Fig. 2:

Graph shows that out of 107 respondents 67% belong to environment problem area; problem related to solid waste and other air, water and land related pollutions which have direct or indirect impact on our health. If these issues can't be controlled it will create major trouble to our future generations. If we relate this with our model it shows that society is majorly responsible for polluting our environment, being educated they are not working to clean our surrounding neat and clean.

*1. What type of environmental problem is there in your area?*

Graph shows that in area of Himachal Pradesh major environmental problem is because of solid waste, with the increase in population and modernization problems related to solid waste has also been increased and it accounts for 38% compare

**What Type of Environmental Problem is there in your Area?**

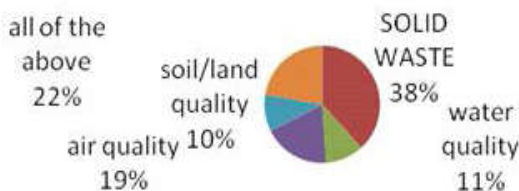


Fig. 3:

to others environmental problems. Problem is related to unscientific removal of solid waste, unhygienic use of plastics has direct or indirect impact of solid waste on health. Though Himachal Pradesh has banned plastics bag still in small villages or people from other states while travelling do bring poly bags which result in creating environmental problem. Colored poly bags are more toxic as they carry harmful pigments and are highly toxic. There shall be proper segregation of waste in order to avoid such problems

*2. Which environmental problem is in worse condition in your area?*

57% of the data shows that solid waste is in worse condition in both rural and urban areas of Himachal Pradesh. After interviewing with localities and noting their views about the reasons responsible for this condition in that area is lack of availability of skilled persons, and lack of availability of their equipments, sweepers don't perform their duties well. In order to avoid such problems proper training should be given to such persons. Then only we can save our environment.

**Which Environmental Problem is in Worse Condition in your Area**

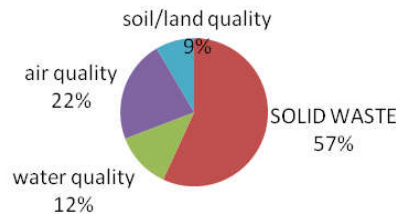


Fig. 4:

*3. Which environmental problem is maximum in your area?*

56% of the data shows that solid waste is in worse condition in both rural and urban areas of Himachal Pradesh. After interviewing with localities and noting their views about the reasons responsible for this condition in that area is lack of availability of skilled persons, and lack of availability of their equipments, sweepers don't perform their duties well. In order to avoid such problems proper training should be given to such persons.

Then only we can save our environment. Waste can be regarded as human concept; presence of waste is an indication of over consumption and is not efficiently being used. If techniques like recycling can be used it will be fruitful to control these.

**Environmental Problem is Maximum**

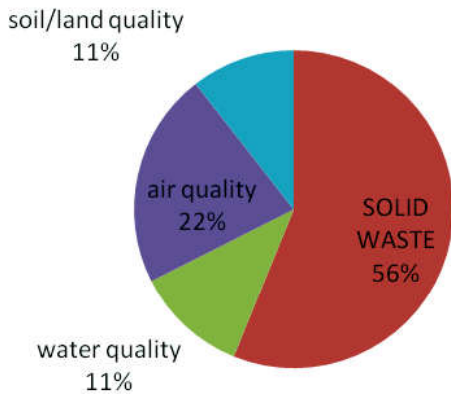


Fig. 5:

4. How often they visit in your area for collection of waste?

Graph shows waste pickers come once in a day to collect the waste that too from garbage bin not from houses. Moreover they mainly focus on the garbage present in the bin and ignore the garbage outside it which results in creating diseases and causes ill effects to our health. If waste pickers collect the garbage twice a day and there is increase in their number of workers then we might be able to keep our society environmental friendly.

**Collection of Waste**

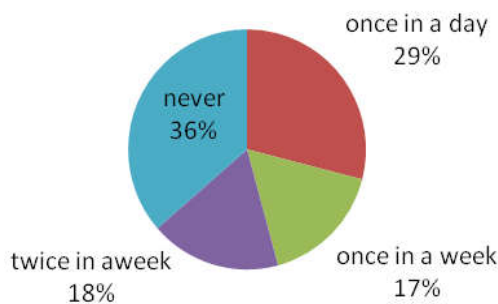


Fig. 6:

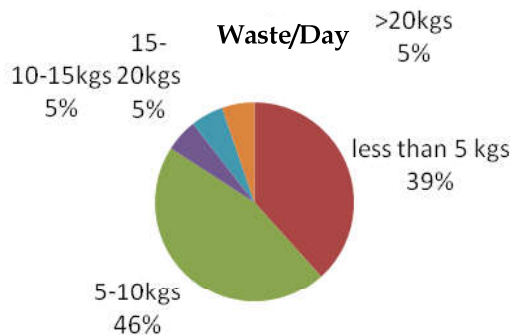


Fig. 7:

5. How much garbage or waste you generate per day?

Depending on the population at our home, garbage generation depends upon, less the number of people in the house less will be generation of garbage at home. Graph shows less than 5kgs waste is being generated by the people per day.

6. How much garbage or waste you generate per week?

Depending on the population at our home, garbage generation depends upon, less the number of people in the house less will be generation of garbage at home. Graph shows >20kgs wastes is being generated by the people per week

**Waste Per Week**

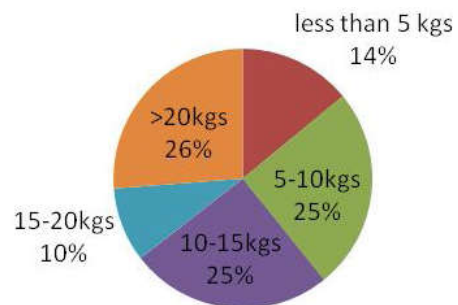


Fig. 8:

**Disposal Method**

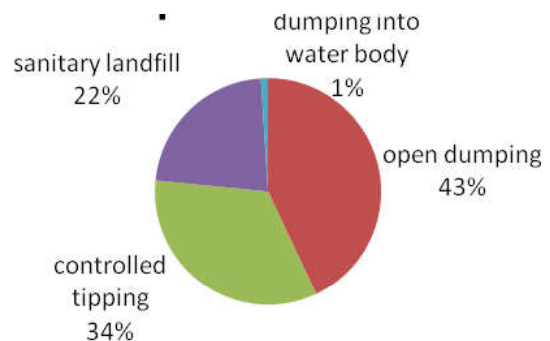


Fig. 9:

7. Which disposal method you prefer?

43% of the people believe in open dumping as people of rural area believe that it's the duty of waste pickers to collect the waste not their work. Some persons believe waste can be used as manure if there is proper segregation of waste which can be done by municipal bodies.

8. Who do you think should have the greatest responsibility for disposing of city's solid waste and garbage?

Environmental friendly surrounding depends on us, it's not a single task rather it's combine task of



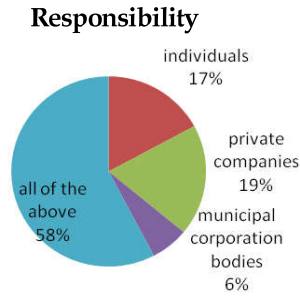


Fig. 10:

both public and private to dispose off the garbage and waste in the bins, and there shall be proper segregation of waste depending upon the type of waste generated by the community.

9. Which solution technique of solid waste you prefer?

Now a day's recycling is major technique in order to control waste generated by the community, recycling is conversion of waste into reusable materials compared to other solution technique, incineration is related to burning of waste which is a form of creating pollution in the surrounding whereas composting is related to generation of manure by composting of waste, which results in formation of biogas.

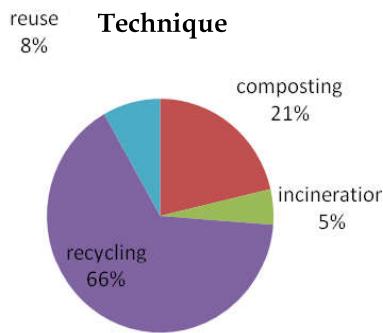


Fig. 11:

10. If you recycle or re-use, why are you doing so?

To conserve resources for the future generation recycling or re using products play major role, there are some of the consumers who promotes recycling because of their family activity, such kind of these things provide a ray of hope that there will be change in the upcoming generation.

11. How can we promote recycling/re-use?

48% of the people convey that to promote recycling awareness plays a major role, recycling is the process of collecting and processing materials, otherwise it

would be thrown as trash and turning them into new products. It results in the reduction of amount of waste sent to landfills and combustion facilities; it saves energy and helps to sustain the environment for future generation. Also it reduces green house gas emissions that contribute to global climate change.

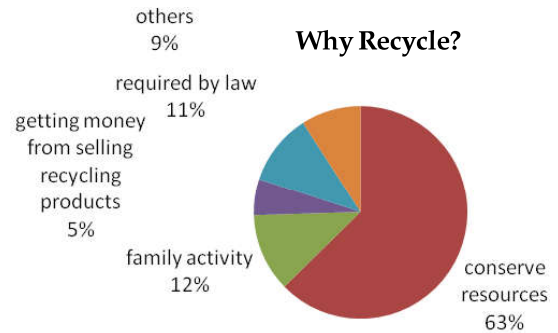


Fig. 12:

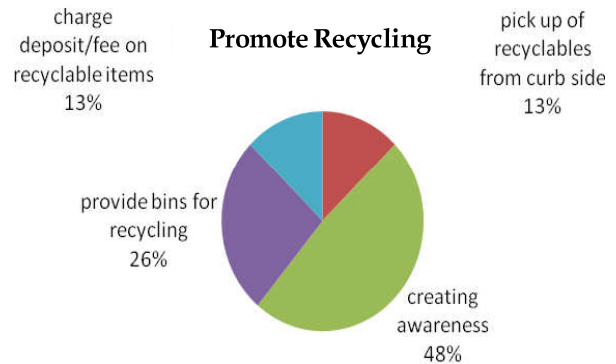


Fig. 13:

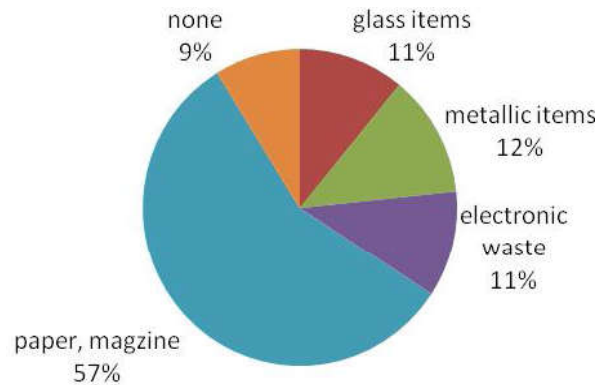


Fig. 14:

12. What does your household typically sell/send for recycling or re-use?

Graph shows 57% of households items typically sells paper, magazine the most and glass items the least i.e. 11%

13. According to you, which amongst these is the best strategy to manage the problem of solid waste/garbage? Choose one option

Best strategy to manage the problem of solid waste is to improve recycling capacity and it undergoes three main steps: 1. Collection and processing. 2. Manufacturing 3. Purchasing new products made from recycled materials.

14. What is the degree of negative impacts of improper solid waste (garbage) management on human health?

Solid waste has severe impact of improper solid waste management on human health which results in creating various issues to human.

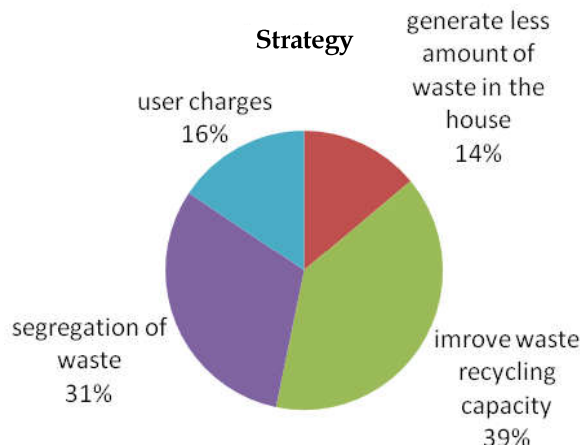


Fig. 15:

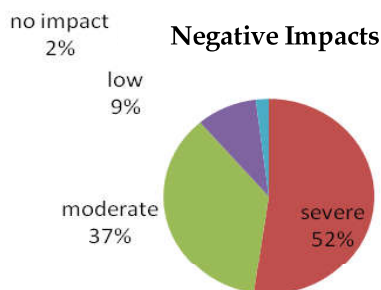


Fig. 16:

**Existence of Waste Pickers**

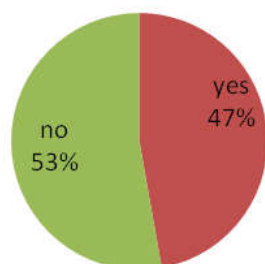


Fig. 17:

15. Is there existence of waste pickers or scavengers in your area

Non availability of waste pickers in locality results in poor condition of surroundings; it can be improved if we hire new waste pickers in the locality whose aim is to make environment eco friendly.

16. Is there segregation for different types of waste?

It's already being cleared from graph that there is no segregation of waste, proper segregation of waste will results in distribution of waste in different bins.

17. Are you willing to segregate your waste?

73% of people show their interest to segregate the waste as it will results in proper disposal of it, waste which can be recycled it can easy to know if it is segregated properly.

**Segregation of Waste**

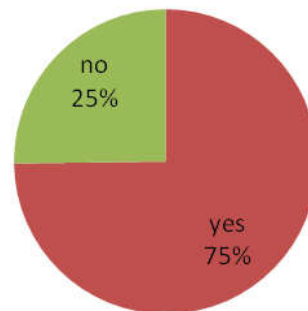


Fig. 18:

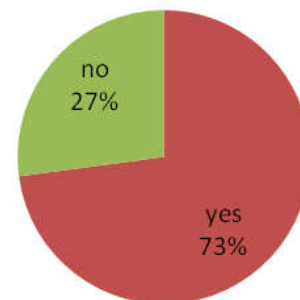


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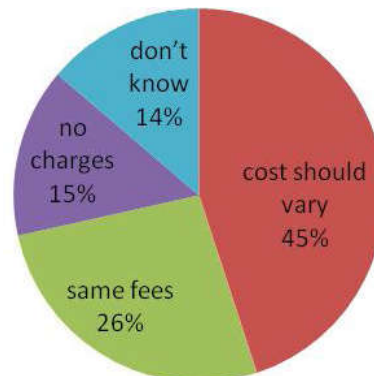


Fig. 20:

18. For residential households, do you think waste management fees should be based on how much waste a household produces, or should all households be charged the same amount?

If we start taking waste fees then it might be beneficial; in that situation they are aware of waste pickers which results in cleaning of environment in better way, but cost should vary from family to family and waste to waste.

19. Do they offer a special training program regarding solid waste management?

Special training programs will tell them how to clean and safe environment in better way, new skills set, techniques and equipments will provide us idea to do such thing in more energetic way.

20. Do you think that the quality of the environment has an immediate impact on our health

**Special Training**

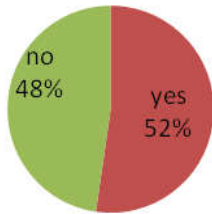


Fig. 21:

**Impact on Health**

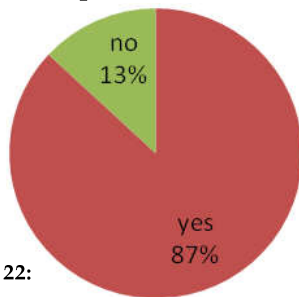


Fig. 22:

21. Which of the following instances of health problems can be attributed to poor environmental quality?

When water borne diseases, skin diseases and respiratory illness combine due to environmental quality it will result in impacting our health in very disastrous way. To avoid these and to think about our future generations these things should be taken into consideration.

**Health Problems**

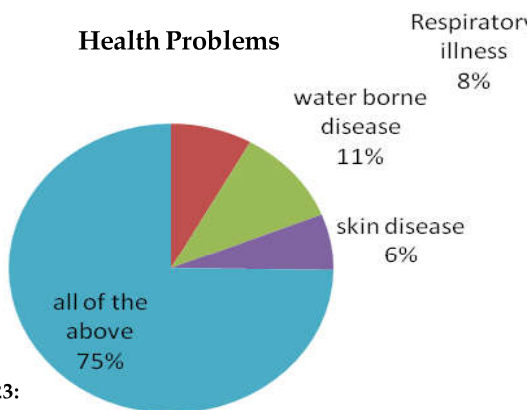


Fig. 23:

22. Which environmental problem do you think has had the most visible impact on people's health?

Water quality accounts for 37% which means that it has major impact on consumer's health compared to other environmental problem, starting from waste or hazardous chemicals which are being discharged resulting in degrading the quality of water, thus poor health majorly shares with the problem of water.

23. Type of storage bin they use for collection purposes?

32% of the population uses plastic bins for the collection of wastes compared to other storage bins as now a day's bins are classified on the basis of color; 1. Food waste caddy—all food should be deposited in the food waste caddy and food waste is being sent for the anaerobic digestion facility when it is turned into fertilizer for agriculture, the biogas is used to generate renewable electricity. 2. Green bin which represent that items are to be placed clean and loose in your green bin. 3. Brown bin which represent garden waste services. 4. Black bin mainly focuses on household rubbish which can't be recycled or reused or composted.

**Visible Impact**



Fig. 24:

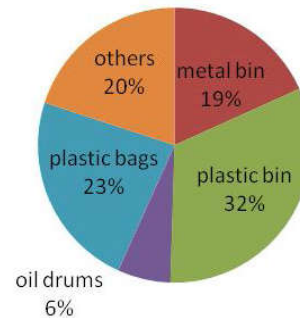


Fig. 25:



Fig. 26:



#### 24. Should the use of polythene bags be banned?

81% of the respondents are in favor of banning of polythene bags, although it's already banned in Himachal Pradesh still there are certain people or tourists who bring polythene bags which results in polluting area, if colored bags are banned totally then pollution creating elements will also be decreased resulting in safer and cleaner environment.

#### Conclusion

The present project entitled "Framework Development of PPP Model on MSW-special reference to Himachal Pradesh" was undertaken in the LM Thapar School of Management, LMTSOM, Dera Bassi. Solid waste is considered to be one of the major problems now days. Framework model beatifically explains how social, ecology and environment are interrelated to each other. A disturbance in one of the factor directly or indirectly impacts our environment. Lack of skilled staff, equipments, techniques etc is some of the issues for the poor environment; it simultaneously affects our health too. Analytical tools like SPSS showed the negative result when we do comparative analysis for environmental problem and Health, it came out to be -0.22 which is direct indication that solid waste is directly proportional to health.

Higher the waste higher the risk of our bad health, if we both public and private sector combines then an effective ways may came out which will be beneficial for both mankind and nature.

Techniques like recycling, reusing of material, composting, avoiding open dumping and throwing garbage in rivers can be effective tools. Government is providing ample of budgets for *Swachh Bharat Abhiyan* and it can be possible with our collective efforts.

Our India can be green, if we all join hands together for one common goal "*Save the Planet Not Only for You but for Your Upcoming Generations Too*"

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