



Application of Technologies for effective Waste Management to promote Sustainable Development in Kingdom of Saudi Arabia (KSA)

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Abstract

This is as part of my research which aims at contributing to 'Sustainable smart city design in Kingdom of Saudi Arabia (KSA) based on nationwide survey on peoples' awareness from waste management perspective to achieve the KSA's Mission 2030 focused on developing and implementing technologies by collaborating with Japan in the areas of technologies to give exponential results with the KSA's efforts. Specially that the KSA is the geographically largest country in the Middle East and becomes opportunity for many foreigners in the areas of Petroleum and natural gas, health care, banking, information technology, media (print & electronic) with certain reservations, real estate, housing, and education etc. According to Kte'pi, Bill (2008), KSA accounts for 65% of the overall population and 42% of GDP of the GCC countries. KSA does not have robust environmental policies. KSA is strong in terms of growth of population, industrialization, and literacy rate to meet the human resource needs of industrial growth and economy, but recently the environmental issues become real challenge to KSA. Urbanization and attitude of people to live in high standards become a cause for pollution of land, water, and air. De-farming and excessive utilization of natural resources are caused deforestation and desertification. This paper is focused on addressing waste management in KSA to contribute better environment and helps in making KSA a happy place to live and to achieve the KSA's Mission 2030 to realize a sustainable way of developing and implementing technologies by collaborating with Japan in the areas of technologies to give exponential results with the efforts made in this area by KSA.

Keywords: Waste Management, Sustainable Development, Saudi Arabia

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I. Introduction

This paper is an annexure to my thesis *Application of Technologies for effective Waste Management to promote Sustainable Development in Kingdom of Saudi Arabia (KSA)*. As per the advice of my Dr. and to improve the quality of my thesis, I have conducted two surveys 1) Awareness of citizens on Waste Management 2) Efforts of Kingdom of Saudi Arabia in waste management and citizens' awareness level about them a survey to collect primary data to know and understand the efforts made by KSA in the areas of Waste Management and Awareness level among citizens about those efforts made by of KSA for managing waste in country.

KSA Administration which helps in Waste Management

Presently KSA having Ministry of Environment, Water and Agriculture and Ministry of Municipal and Rural Affairs are likely falls under category of managing waste in KSA and Ministry of Housing and Ministry of Labor and Social Development also took a part some extent.

According to Ministry of Environment about 9000 tons of solid municipal wastes are buried in a health-based way at a specific facility. A small percentage of these wastes are recycled, and about 42 tons are treated daily with the safe removal of medical wastes.

The ministry is committed to :

- a. to a comprehensive strategy for waste management to achieve a sustainable environmental standards and
- b. actions to protect the environment and the general health from the effects of these wastes through sorting them from the sources to benefit from them As well as
- c. Setting up a new treatment facilities with the assistance of the private sector
- d. To build eco-wellness by safeguarding nature in a sustainable manner

To ensure whether the actions that are taken by KSA is in line with commitment and how KSA considered role of citizens in achieving its objectives and whether efforts are keeping citizens informed about its action plans to gain cooperation from them. Will be unveiled in coming part of this paper

II. Methodology

This survey has been conducted by taking effective sampling mechanism to cover all categories of citizens of KSA. Sample size which covers almost all categories of citizens in terms of various demographic factors, distinct income groups, and people of diverse education levels who maintains different economic status levels. For instance we have taken respondents size who are residing in various types of houses Single detached house, Semi-detached house, Townhouse, Apartment building under 6 units and Apartment building over 6 units by believing that waste generation levels can be broadly found by looking at the life style of citizens of KSA. From our sample when I enquired about what kind of residence do they live in I came to know that about 40% of citizens live in Semi-detached house, 19% of people live in Townhouse, 19% of people live in Apartment building under 6 units and small % people live in Single detached house whereas minor part of people i.e 7% people live in Apartment building over 6 units.

Efforts of KSA in waste management and citizens' awareness level about them

KSA doing well in within its constraints when I enquired citizens about their *opinion on waste in KSA causing Environment issue*; about 35% expressed their opinion that waste is causing water and Air pollution in the country; about 25% expressed their opinion that waste is causing Air pollution; about 16% expressed their opinion that waste is causing Water pollution; about 15% of people expressed their opinion don't even consider that any Environmental issues due to waste and about 9% expressed their opinion that waste causes adverse environmental conditions; overall 85% people agreed waste causing environmental issues

1. Your opinion on waste in KSA causing Environment issues

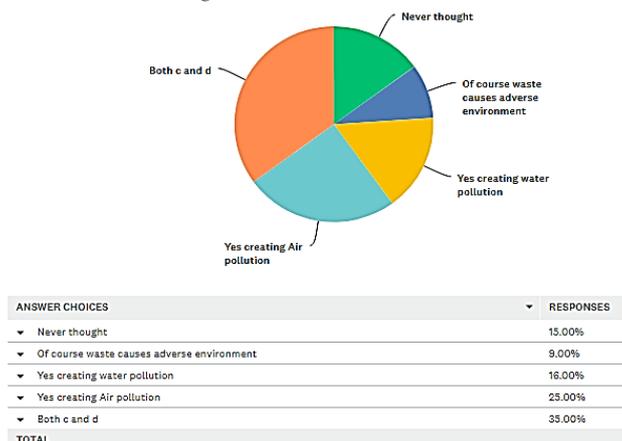


Figure 1

When I enquired citizens about Government efforts on waste management programmes were witnessed by them *Have you seen Government efforts on waste management like campaigning, awareness programs etc*; about 46% of people expressed they don't know Governments efforts on creating awareness; about 35% of people expressed they don't remember any Governments efforts on creating awareness; about 19% expressed they nod that they have seen Governments efforts on creating awareness; which means government efforts on creating awareness on waste management are not reaching to general stakeholders

Have you seen Government efforts on waste management like campaigning, awareness programs etc,

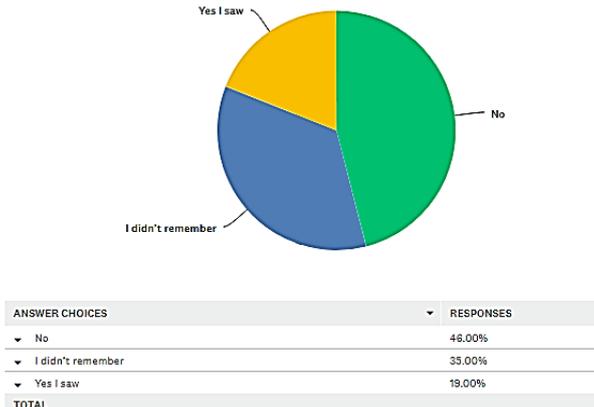


Figure 2

When I enquired citizens about efforts of private organizations on waste management programs were witnessed by them with a query of ‘Have observed Involvement of private sector enterprises in creating / participating aforesaid programs’; about 58% of people says that they don’t saw any private sector participation in creating awareness on waste management; about 38% of people said that they don’t recognize any private sector participation in creating awareness on waste management; Only 4% expressed they nod that they have seen Private Organizations’ participation on creating awareness; which means government efforts to make private organization responsible on creating awareness on waste management are not happened to the best.

Have observed Involvement of private sector enterprises in creating / participating aforesaid programs

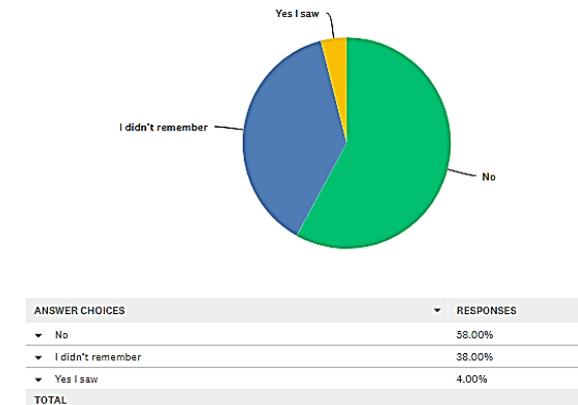


Figure 3: observed Involvement of private sector enterprises in creating / participating aforesaid programs

When I enquired citizens opinion about necessity educating young citizens through education system with the query of ‘Any initiatives about waste management in education system’; about 78% felt that initiatives must be taken in education system on waste management like including few project works which helps to educate children about waste management and environment; only about 22% do not feel any need of initiatives in education system on waste management due to two reasons as existing programs are enough or those programs may adversely affect regular academics.

Any initiatives about waste management in education system

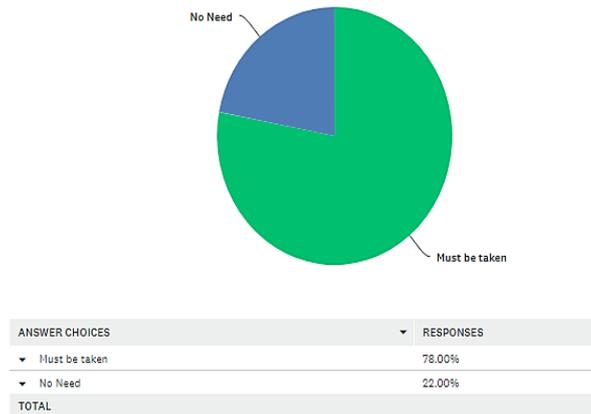


Figure 4: initiatives about waste management in education system

When I enquired citizens' opinion about medium which plays key role in creating awareness on waste management with the query *Which media playing key role in creating awareness on waste management*; about 33% expressed that Government efforts are good at creating awareness; about 11% expressed that Social media is playing vital role in creating awareness; about 5% agreed that Waste recycle depot is playing key role in creating awareness; about 4% agreed that Electronic media is playing vital role in creating awareness and another 4% agreed that Print media is playing vital role in creating awareness; where are about 43% expressed that all type of media i.e Electronic, Print, Social media, Government efforts, waste recycle depot playing crucial role in creating awareness;

Which media playing key role in creating awareness on waste management

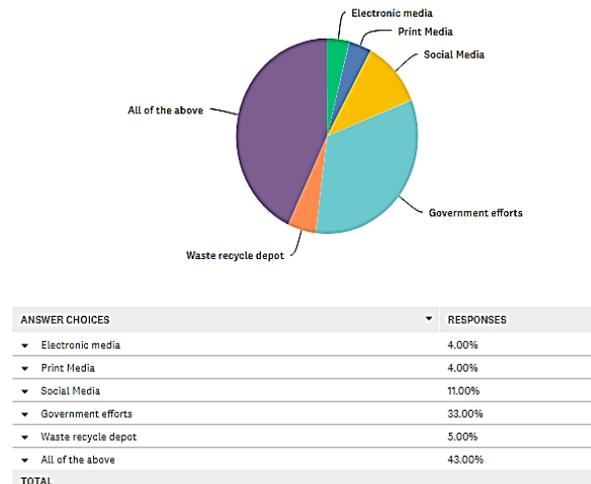


Figure 5: media playing key role in creating awareness on waste management

When we asked citizens about *rating that they can give for Government effort to keep environment Clean and Green by creating awareness on waste management*; about 36% rated 2, about 34% rated 1, about 17% rated 3, about 9% rated 4, and about 4% rated 5 in point scale in KSA government in keeping Clean and Green by creating awareness on waste management. (Please not query is on keeping clear with the help creating awareness, but KSA is doing good on other factors to keep city clean and green)

Rating that they can give for Government effort to keep environment Clean and Green by creating awareness on waste management

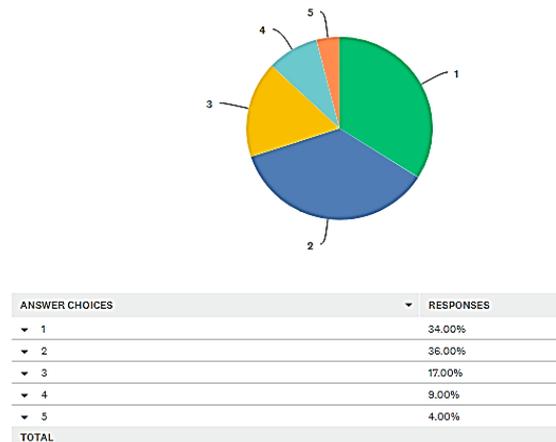


Figure 6: Government effort to keep environment Clean and Green by creating awareness on waste management

When we asked about various *remedies available to solves the existing problems in waste management*; about 33% opined that Government initiatives are crucial for solving problems in waste management; about 12% opined that Establishing waste cycle yards will solve problems in waste management; another 12% expressed that Framing Proper Environmental laws will solve problems in waste management; about 2% opined that Use of technologies in waste cycle yards will be remedy for problems in waste management; where as 39% opined all factors should be taken to solve problems i.e., Citizens’ awareness, Government initiatives, Establishment of waste cycle yards, Proper Environmental laws to be framed, Use of technologies in waste management – all should be given priority to solve existing problems in waste management.

What are the remedies available to solve existing problems?

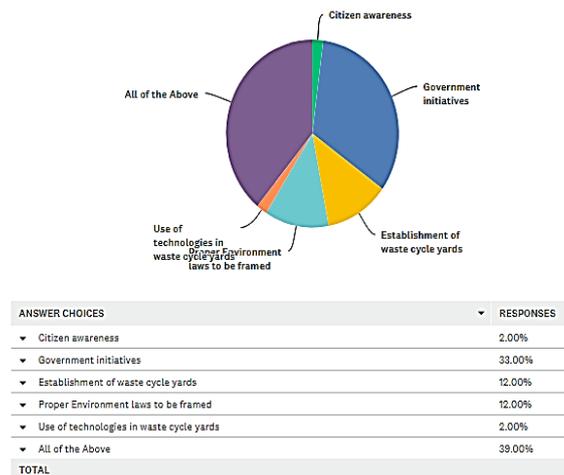


Figure 7: remedies available to solve existing problems

When we asked about who shall be most *responsible to take initiatives in creating and implementing waste management programs*; about 37% expressed that the Government can only solve the all waste management relevant problems in waste management; about 13% expressed that Government and Private companies have to take major initiatives like providing infrastructure facilities and General public need to take key role in implementation part; about 6% expressed that Private companies can do their best in solving waste management problems; about 6% agreed that General public can solve the problems of waste management; whereas about 38% agreed that Government, Private companies, General public all need to take equal role in solving the issue
In your opinion ‘Who have to take these Initiatives’

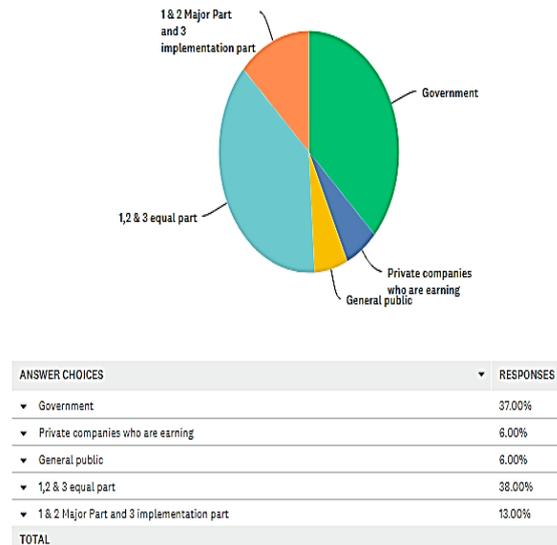


Figure 8: Initiatives opinion

Since our motive is to Develop, implement and use of technologies in the waste management we have included a query in our research queries with a query *Role of technology present and future*; all participants unanimously agreed there must be use of technologies; out of them approximately 45% respondents expressed that Technology plays vital role we should use existing technologies and no need t develop new technologies; where as 55% respondents nodded their agreement to develop new technologies as there is high possibility to occupy in this sector.

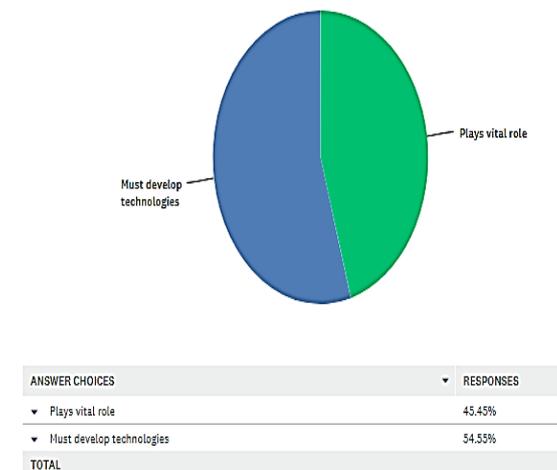


Figure 9: Role of technology present and future

III. Findings and recommendations

e. Findings

- KSA efforts are not reaching to Majority of the citizens of KSA
- Citizens are aware that waste causing environment pollution
- Majority of the citizens opine Govt plays key role in creating awareness
- All modes of media plays key role in creating awareness but of which Social media and Government initiations play vital role

- KSA efforts are not known to general public
- Technologies plays key role in waste management

f. Recommendations:

- Certainly technology plays critical role in solving waste management issues. As many new technologies are invented and implemented in scientifically developed countries KSA need to adopt those

technologies according to its needs. There are various techniques according to needs like Recycling, Power generation, Composting etc.

- By doing waste management if any benefits arise they should be distributed among public based on their participation. For eg: If power is generated by waste management such power can be distributed either based on their contribution or at low cost.
- Recognition through Rewards and Awards to municipalities and organizations for their best waste management practices.
- More budget allocations for municipalities who are best at waste management.
- To promote competency among municipalities rankings can be given nationwide so that it gives motive to implement best practices.
- Majority of people are opining that waste causes pollution. Awareness should be created among all groups of people from Government, NGOs how improper waste management leads to not only pollution, but also its permanent consequences like health issues, depletion of various resources. In Japan mercury pollution led to Minamata disease. In India many rivers became just drainages. These are unending. So people should be made aware of all these so that they can segregate at source level.
- Majority of the people either don't know or don't recognize the efforts of Government means that shows minuscule efforts of Government on creating awareness. Government must give equal priority to provide awareness as it gives to creating facilities in waste management. It should become flagship program of Government. Government should go with Campaigns, Seminars, Various media, Public places, Promotion by celebrities etc.
- Private sector with their social responsibility need to create awareness on waste management.
- Not only creation of awareness at their respective locations they need to implement their own waste management structures and by this employees do understand the importance of waste management.
- Private sector can best play its role in creating infrastructure as it needs huge capital.
- Sensitizing students on waste management at all levels of schooling should become a primary educational reform. This does not give result of addition of efforts but gives multifold results as this reduces any other awareness creating costs drastically in future.
- It must be taken care that not only sensitizing on benefits of waste management but also it should be taught practically. Students must be involved in the process of waste collection, recycling process to the extent possible.
- In each class students committees/groups can be created for this purpose.
- Students must be encouraged in this process by giving recognition to them as equally with other curricular activities.
- Media plays link role between Government and General public. If media gives importance to public issues like waste management it can become public movement which can be solved within minimal time. In present scenario Social media can be best used by Scholars, Scientists to explain the benefits of waste management.
- Government role does not end by merely budget allocation, border protection but it mostly extends to allocation of resources in best possible way.
- Government efforts are crucial in bringing solutions for waste management. Implementing new technologies, framing strong environmental laws, establishing new recycle yards and above all creating awareness among people can be best done only by the Government. Without Government initiatives in all these matters effectiveness will be minimum.
- It can be very well agreed that in providing Infrastructure facilities Government and Private companies can play indispensable role as it requires giant capital

IV. Conclusion

Thus this survey helped me a lot by showcasing the significance of role and commitment of a government in making / influencing people of the economy not only on one particular issue but most of the issues. This may be due to King Rule in KSA; But we have, as researcher, we should believe, sort out and inform necessary actions to make KSA a better way by creating sustainable environment. I strongly believe if every citizens of KSA focus on this and stakeholders cooperate to make KSA a green place to live happily within 25 years climate also start changes to normal conditions, earth become more fertile which can help to grow better trees and helping to reduce global warming too

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