

Issues and Remedies of Sewage Treatment and Disposal in Islamabad, Pakistan

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Abstract:

Like any under developed country, Pakistan also faces serious issues of urbanization and ribbon growth in its population centers like Karachi, Lahore and Islamabad. There is a massive trend of social change where people migrate from rural to urban areas at an alarming pace. Due to paucity of funds, the government could not stop this dangerous trend. As a result, the existing sewers and sewerage schemes in these cities could not sustain and accommodate additional biological loadings due to shift of population. Eventually there is general problem of treatment and disposal residential sewage and human excreta... It is well known fact that sludge production will continue to increase due to urbanization, mass migration and exponential growth in housing sector. Consequently improper disposal of domestic sewage and human excreta has posed serious problems of health, environment and bio degradation in major urban areas and population centers. This research has been under taken to study the efficiency of traditional sewage management systems and evaluate the possibility of using cutting edge technology of Biofilter Sewage Treatment Plants (STPs). For this propose, questionnaire was designed and disseminated among industry specific respondents. A total of 150 questionnaires were distributed out of which 100 valid responses were received. Thus response count comes to 66.67 percent which is healthy rate for carrying out further research. The major findings include; under capacity of existing sewerage system due to urbanism and growth in housing sector, inadequate supply of funds, in adequate knowledge of STPs and their secondary benefits, and environmental issues arising out of poor sludge management. The authors recommended that if measures like national sanitation policy, awareness campaign on efficiency of STPs, sufficient supply of funds and concessions in import of STPs are adopted, then sewage related problems can easily be addressed in a holistic manner across the country.

Keywords: *Biological Oxygen Demand, Islamabad, Pakistan, STP.*

1. INTRODUCTION

Over population and unbalanced displacement of masses leads to overloading of existing water and sanitation schemes. This becomes true when there is a rapid urbanization in the major cities. The trends of urbanization in the developing countries, like India, Pakistan, Sri Lanka, Indonesia, Thailand and Philippines are phenomenal. Unfortunately this unhealthy trend has resulted into serious environmental and sanitation issues .This holds good for Pakistan in general and Islamabad city in particular. The existing sewer lines which were laid a decade age, have proved to be insufficient for additional sewage and biological loadings in Islamabad. In order to confront with this problem, a need for installation of Sewage Treatment Plants was felt, in all residential sectors of Islamabad.

BENEFITS OF BIO-FILTER STPs

- Minimum construction for Bio filters Technology as compared to other conventional systems.
- Design is very compact for a total solution.
- Bio filter Technology allows for quick re-commissioning in case of down time.
- Simple operation / low manpower required.
- Effective and proven process aerobic operational principle.
- Cost effective.
- User friendly low and easy maintenance.
- Bio filter Technology utilizes minimum electrical consumption.
- Long service life as concrete structures are permanent.
- Discharge can meet any desired standards.

2. Scope and Objective

This is a unique issue which has been analyzed through in-depth research and objectives were set as under:-

- To identify the condition of existing underground sewerage system in Islamabad.

- To identify the main reasons and causes of biologically overloading of sewers.
- To highlight the effectiveness and efficiency of Sewage Treatment Plants in Pakistan.

3. LITERATURE REVIEW

The problem of sewage disposal in provincial capitals and major cities of the country is growing day by day as result of overloading of traditional underground sewerage system. The main reason is the shifting of masses from rural areas to urban areas for better education, medical and housing facilities (Murtaza-2005, Hall-2006).

It has also been observed in some population centers that traditional disposal system completely collapsed and ad-hoc arrangements have been made for connecting them to the nearest natural drains or water bodies. Thus this unplanned arrangement contributes towards water pollution and threats to aquatic life (Islam et al -2010, Tilchi et al-2006).

There are several reasons for the over loading of existing sewerage schemes some of which can be cited as new urban settlements, ribbon growth, housing colonies, conflicts with planning of existing and new infrastructure projects. Ultimately all industrial as well as domestic sludge is disposed off into fresh water nullahs, streams and rivers (Afaf Ayesha-2012, Hayder-2009, Pak-EPA/OECC Study).

Due to ineffectiveness of local bodies and absence of long term planning at district level, sludge and solid waste management has become point of serious concern with respect to environmental pollution health and epidemic diseases, and bio degradation. Another major cause of collapse of traditional underground sewerage system is expansion of peri-urban *katchi abadis* and informal settlements which are never properly linked and supported with additional infrastructures. A linkage between formal and informal settlements is thus not created (Zulfiqar-2009, Mussarat et al-2007, Murtaza-2010). Most of the rural areas have no sanitation schemes developed by the government similarly solid waste management systems exist to some extent in major cities of the country (Zulfiqar-2009, Anwar-2012, Ahmed-2013).

Contrary to this problem, the average government's spending on sludge treatment and management is even less than 0.2 per cent of GDP. The institutional and managerial capacity of Tehsil Municipal Administration (TMA) is very weak despite the fact that primary function of TMA is to plan and implement sanitation and sewage disposal schemes (Sheikh-2012, Khan et al-2012).

Most of the sewage disposal in Pakistan is based on water borne sanitation system. Unfortunately Pakistan has become water scarce country due to depleting ground water aquifers and surface run off. Therefore search for other non conventional water resources for irrigation i-e; wastewater has become important. There is need to conserve the available water resources including waste water. This can be made possible by use of state of the art sewage disposal technology successfully being used by European Union. (Zulfiqar-2009, Zakria et al-2011).

After sewage treatment, the solid belt pressed material can be used as fertilizer and water can be used in horticultural purposes. Apart from this, several other measures can be put in place to mitigate the effects of wastewater. These can be installation of hypo chlorinators on contaminated tube wells, re-routing of distribution lines away from sewage drains and replacing worn out parts, and construction of a proper waste water collection system (Sheikh et al-2012, Ahmed et al-2013, Murtaza et al-2010).

It is also said that worldwide water pollution is a leading cause of deaths and diseases and it is resulting 14,000 casualties daily. Hence it is not only treat the sewage but also disposal of wastewater or sludge water is also very important. Moreover it is the necessity of checking urbanization, population growth and water conservation for secured future (Afaf Ayesha, 2012).

According to UNEP 1991, sewage treatment plant for Port Said has proved to be very effective and efficient system. Due to the penalty of fresh water acquirers in the country, its management in especially urban areas needs more attention b all stakeholders.

There are some low cost sewage treatment plant which can treat domestic and industrial sludge simultaneously. According to the researchers, the majority of the sewage lines contain both types of biological loadings. The sewage contains varying degrees of biological Oxygen Demand (BOD) and chemical Oxygen Demand (COD), from 200 to 2000 milligram per liter. Disposal of industrial waste warrants special attention due to presence of toxic and metal particles (Anwar et al-2013, Zulfiqar-2009).

4. RESEARCH METHODOLOGY

This research was spanned over two phases i.e.; data collection and data analysis. For the purpose of data collection, a questionnaire was designed after studying pertinent literature as well as visiting of several construction project sites and their sewage disposal arrangement. The questionnaire was divided into two parts.

In part A, general information about respondents was asked so that reliability of the data can be ensured. In part B, specific questions were asked.

As an initial step, the authors discussed about the questionnaire and its all contents with industry related civil engineers, Public health experts and engineers, contractors, construction managers, architects, design professionals, suppliers, sub-contractors, supervisors and local residents for ascertaining and confirming whether this questionnaire was enough for data collection. After through discussions with renowned and well reputed industry professional constructors , builders and designers like M/S Ahmad Zaka & Associates, M/S Amin Tariq & Associates, M/S Suhail Ahmad & Associates, M/S Shami Associates, M/S Tijaarat Developers and M/S Adeel Associates, the questionnaire was approved with minor modifications and adjustments.

In the next step, the authors carried out random sampling for the selection of the respondents. A total of 150 questionnaires were distributed among respondents. The panel of authors received 100 completed questionnaires, which comes to about 66.67 percent of response. Once this major milestone was achieved, the authors analyzed the data using statpro software.

5. RESULTS AND DISCUSSIONS

The data which has been collected by the authors was analyzed by using statpro software. The results are presented in succeeding paragraphs:-

5.1 *General Information about Respondents.*

This is a specialized research topic for which relevant and industry specific respondents were selected for data collection. The respondents comprised of regulatory body officials, proprietors, architects, public health engineers, developers, civil engineers and residents facing sewage related problems. The composition of respondents is shown in fig 1 (a & b)

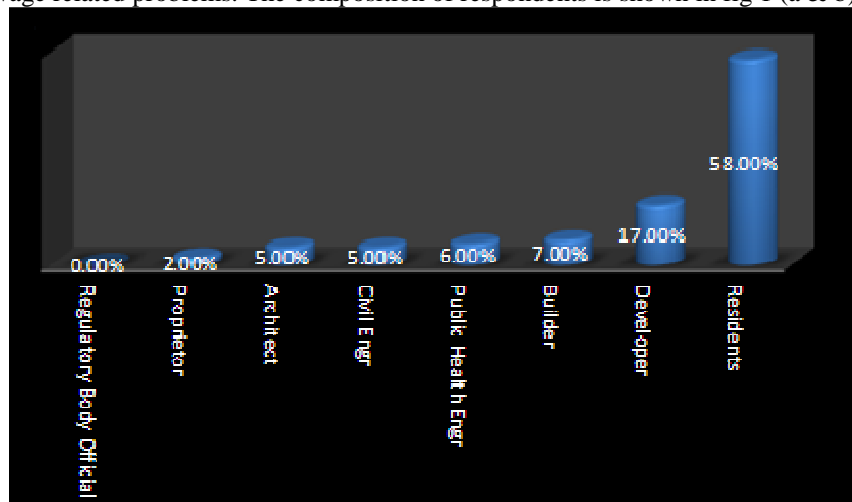


Fig (a): Category of Respondents

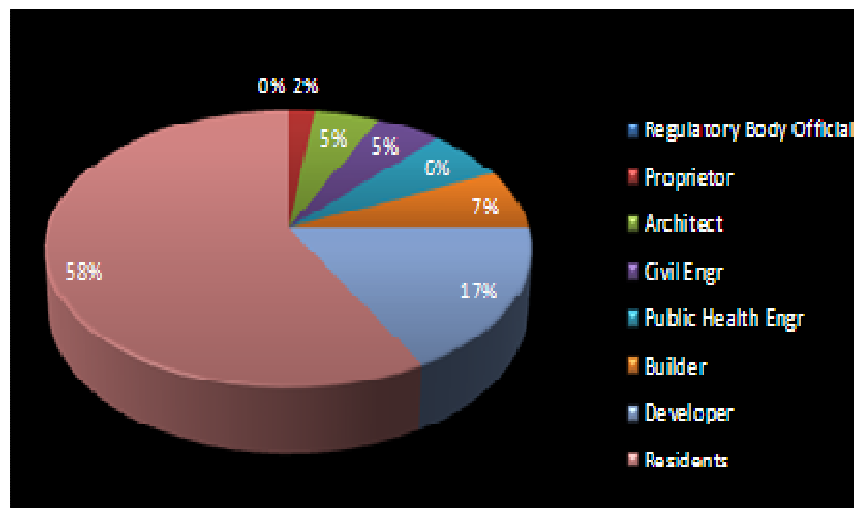


Fig (b): Category of Respondents

5.2 *Experience of Respondents.*

This domain was spanned over all age groups covering period from 05 years to more than 50 years. The results can be seen as under:-

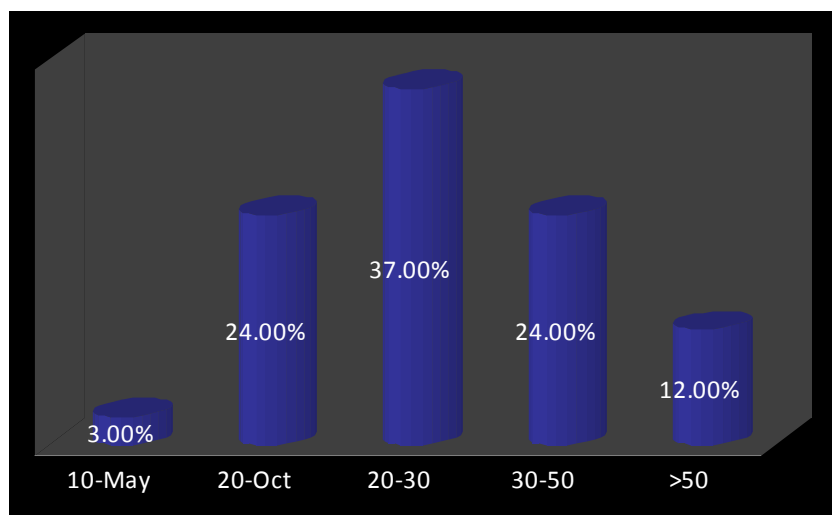


Fig 2 (a): Age of Respondents

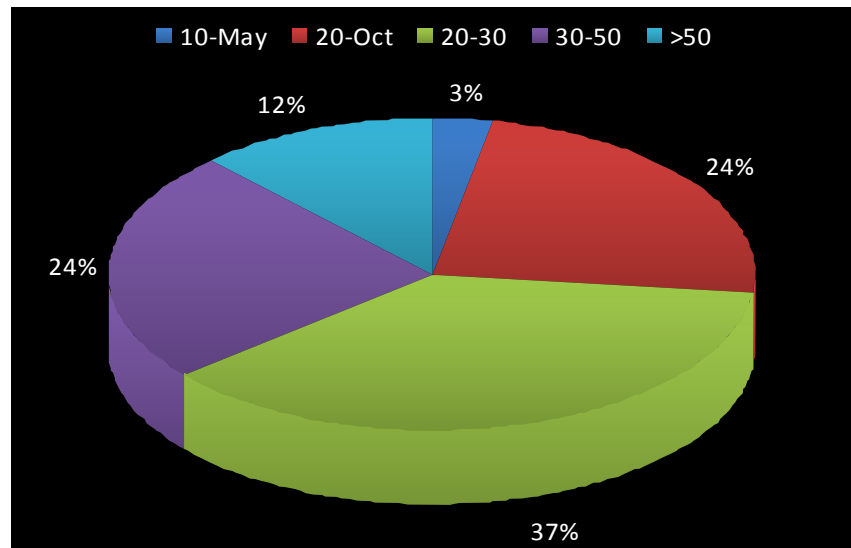


Fig 2 (b): Age of Respondents

5.3 *Condition / Functionality of Existing Sewage System of Islamabad.*

In this domain, the primary objective was to get the public opinion regarding operationally of existing underground sewerage system. As the population growth increased due to urbanism and massive settlements, these sewers have been over loaded with biological sludge. Thus the unanimous opinion of the respondents indicated that existing sewerage system has become insufficient to take additional biological loadings due to complete saturation.

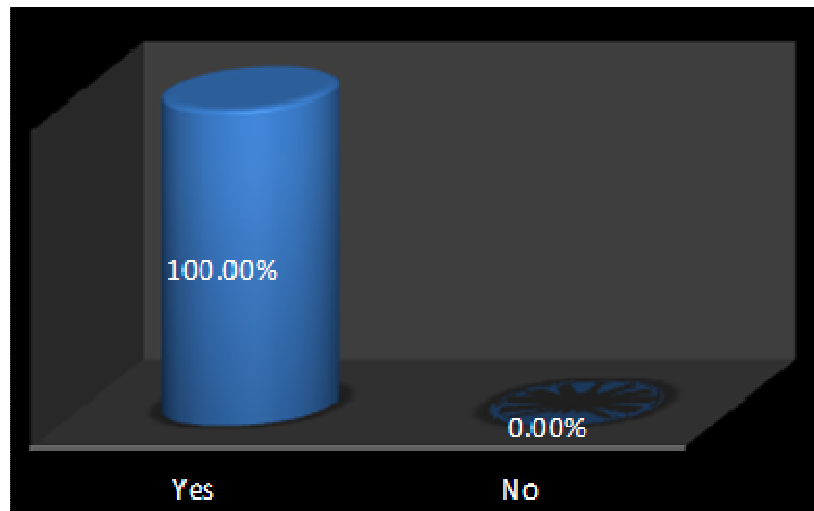


Fig 3: Existing Sewerage System

5.4 *Problems and Effects of Existing sewerage system.*

As with any major cities in the developing economies like India, Sri Lanka, Thailand, Philippines, Indonesia and China, the capital city of Pakistan, Islamabad is also facing sludge management issues. The major problems and effects are, threat to aquatic life in Rawal lake,

boiling manholes in Tarlaie, Taramari, chak Shahzad, and Farash Town, expensive maintenance by capital development Authority (CDA), bio degradation, environmental pollution, water contamination in Rawal lake and laie Nullah, ground water pollution and incapacitated underground sewerage system. The rankings and priorities labeled by respondents have been explained on fig -4 (1 & b) below:-

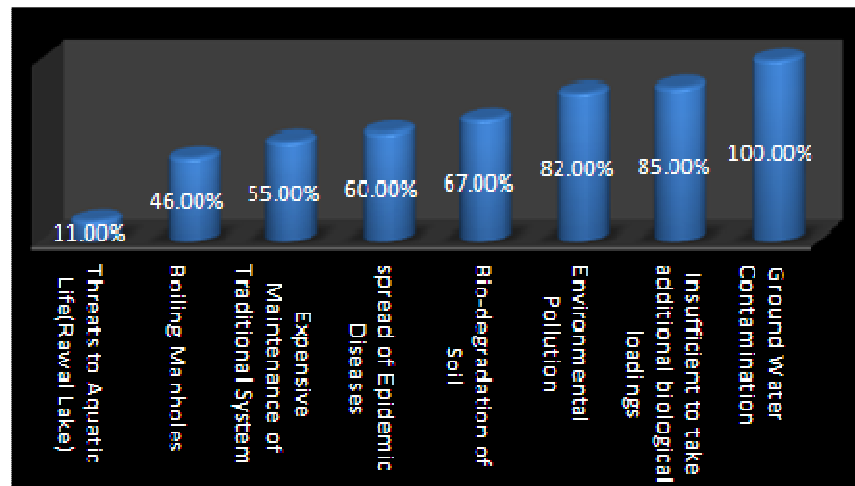


Fig -4 (a): Problems of Effects of Existing Sewerage System

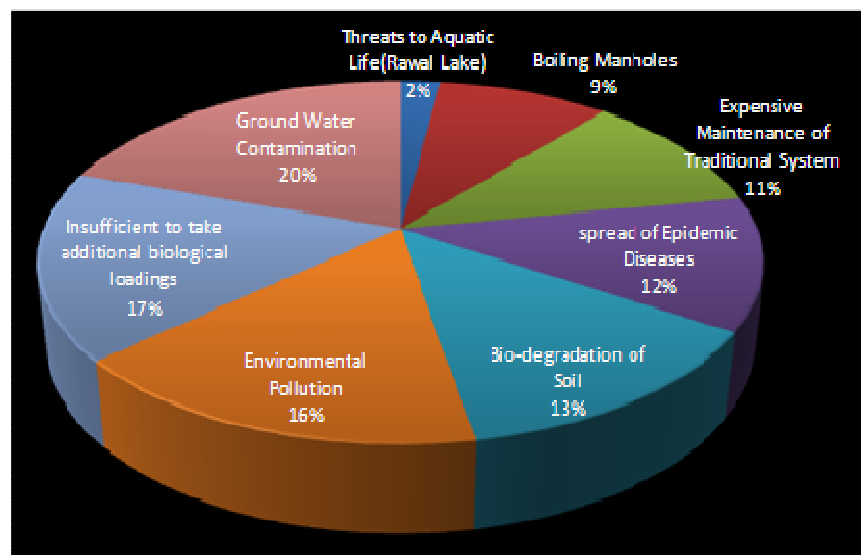


Fig -4 (b): Problems of Effects of Existing Sewerage System

5.5 *Major Causes of Collapse of Existing Sewerage System in Islamabad.*

In this domain 13 main causes were defined through surveys. In the late stage of data collection these have been ranked as reflected of fig 5 (a) (b) below:-

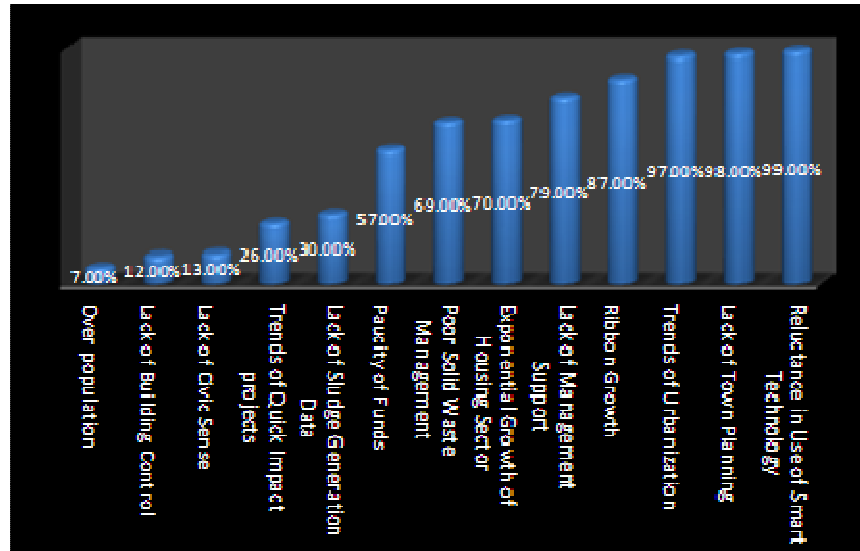


Fig 5 (a) Main Causes of Disruption

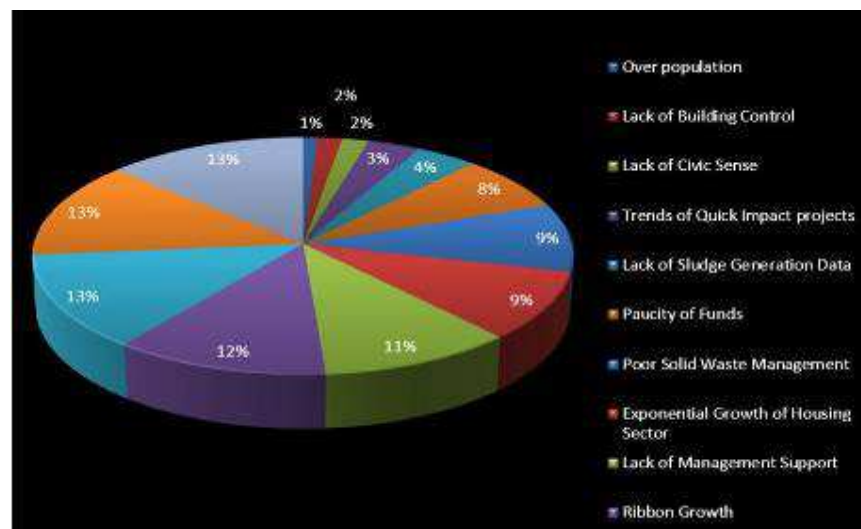


Fig 5 (b) Main Causes of Disruption

5.6 General Trend of Use of STPs.

After having ascertained the inefficacy of traditional underground sewer lines system, this domain was created to know whether is there any public will and resolve for introducing sewage treatment plants (STPs) in country’s most modern city of Islamabad. The response was very healthy where 100 percent respondents indorsed the idea.

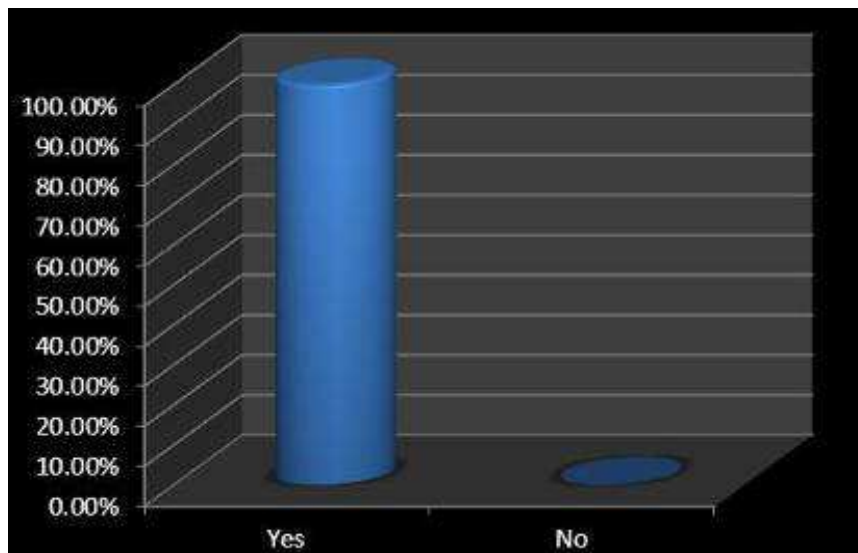


Fig 6 General Trend

5.7 Primary and Secondary Uses of STPs.

Sewage Treatment plant (STP) is the state of the art technology which is environmental friendly, operates on low electric power, cost effective, generates fertilizer, and re use of water for car washing and horticultural purposes etc. The respondents gave different opinions and rankings as shown below:-

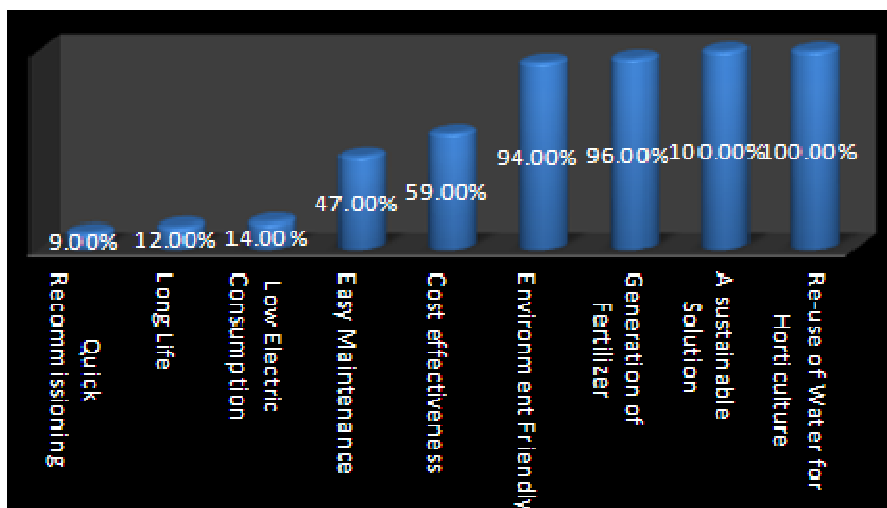


Fig 7 (a) Uses of STPs

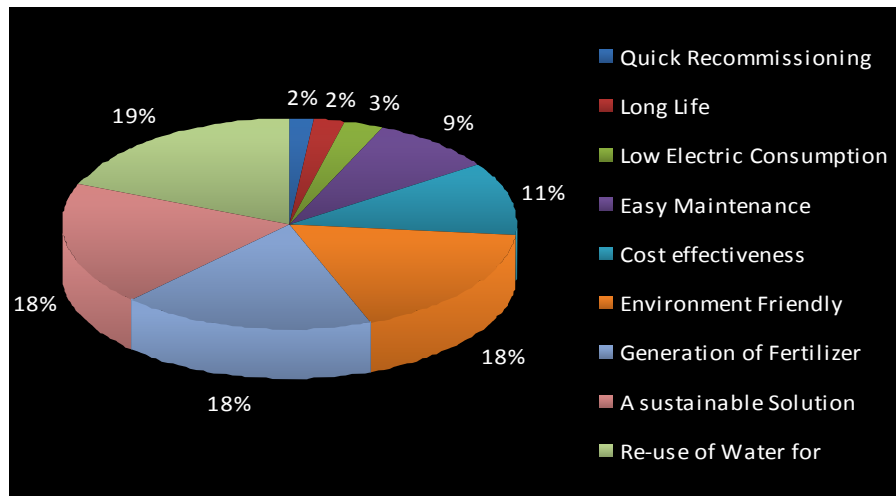


Fig 7 (b) Uses of STPs

5.8 *Remedial Measures Against Sewage Problem.*

There are different measures which can help mitigate problems arising out of sewage management like; control on population, public awareness, enhancing capacity of sewers, use of STPs, adequate supply of funds and effective town planning etc. The response count in shown in fig 8 (a) and (b).

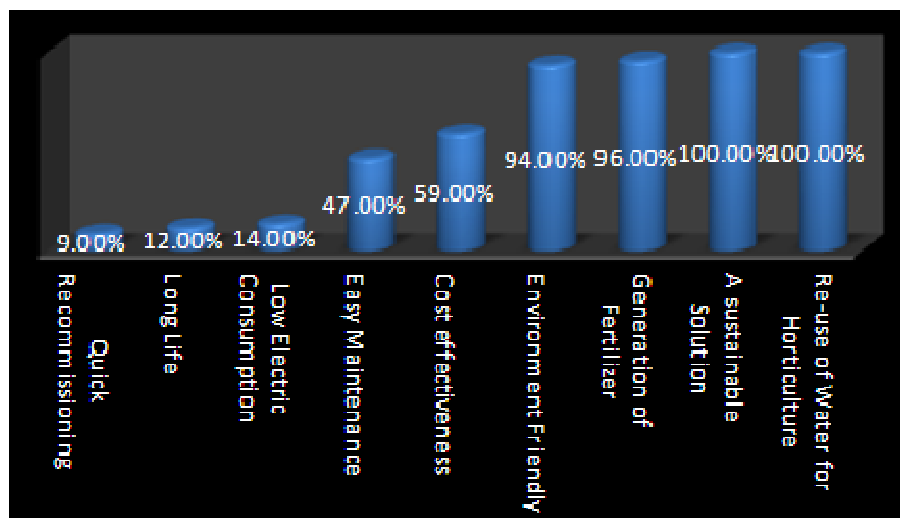


Fig 8 (a) Remedial Measures

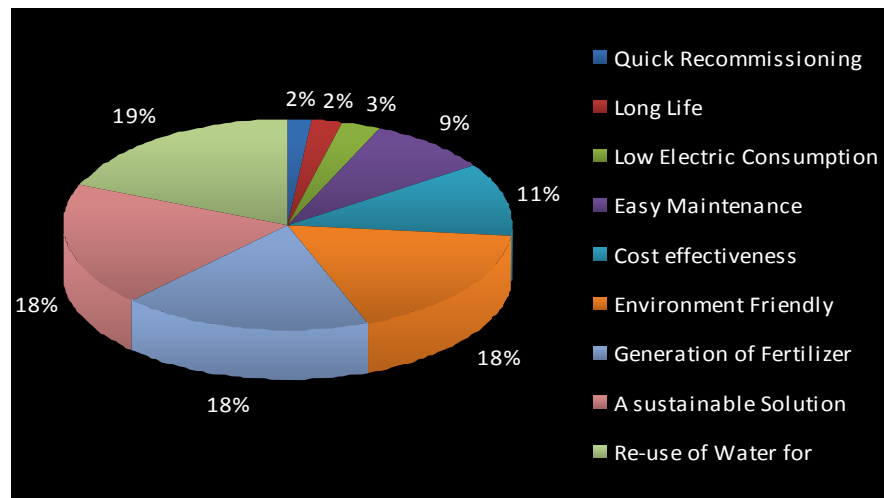


Fig 8 (b) Remedial Measures

6. Conclusions and Findings

5. Basing on the results and discussions, following conclusions have been drawn:-
 - 5.1 There is a general consensus about saturation of existing underground sewerage system in Islamabad.
 - 5.2 The existing system of sludge disposal is insufficient to take additional biological loadings.
 - 5.3 Environmental pollution and ground water contamination are the main ill effects of choked sewers.
 - 5.4 It is established that urbanization, peri urban settlements and exponential growth of housing sector like Defence Housing Authority (DHA), Bahria Town Private Limited, Roshan Pakistan and Gulberg Islamabad schemes have over strained existing sludge disposal schemes.
 - 5.5 Due to paucity of funds, there is reluctance in use of STPs by public service departments.
 - 5.6 It is also proven fact that STPs installed at Park Road, Chak Shahzad and Farash Town are a successful venture.
 - 5.7 There is a unanimous consensus over introduction of STPs in all sectors and housing schemes of Islamabad due to its robustness and cost effectiveness.
 - 5.8 Apart from sludge treatment and disposal, STPs generate fertilizer and recyclable water with BOD of less them 30 milligram per liter.
 - 5.9 Installation of STPs is a sustainable one time solution which occupies minimum space but renders maximum productivity.
 - 5.10 Adequate supply of funds, effective town planning and relaxation in import duties for impost of STPs will help solve most of the sewage related problems in Pakistan

7. Recommendations

Keeping under consideration, the major findings following recommendation are professed:-

- 7.1 *National Sanitation Policy.*
 At present there is no worthwhile sanitation policy for addressing issues like sludge generation data, wastewater and solid waste management in all parts of Pakistan in general and Islamabad in particular. Although CDA is launching good initiatives towards green city program but still there is a lot to be done.
- 7.2 *Awareness About STPs.*
 Majority of the policy makers and public service officials are unaware of the effectiveness and efficiency of STPs. Moreover there is misconception about heavy initial cost of STPs. It is recommended that more awareness be inculcated to sponsoring organizations, NGOs and policy makers through field visits in chak

shahzad and Farash Towns where STPs are successfully working under the best productivity levels.

7.3 *Adequate supply of funds*

This issue can be resolved through public private partnerships.

7.4 *Concessions on Impost duties for STPs.*

Government of Pakistan should relax import and custom duties in order for bringing in the smart technology of STPs for addressing sewage management issues.

References

- [1] Murtaza, 2005 “*Urban Development in Pakistan chapter 9, urban development in Pakistan*”
- [2] Hall Jeremy, 2006 “*Ecological and Economical Balance for sludge management options*”, Page 155-183.
- [3] Tilche Andrea et al, 2006, “*Alternative waste water Treatment processes to reduce sewage sludge production*” page 184-2011
- [4] Lt Col Islam et al “*Adverse Effects of poor waste Management practices on ground water quality in Rawalpindi and Mitigation Strategies*”.
- [5] Afaf Ayesha – 2012, “*Pollution of water bodies challenges and strategies*” centenary celebration 19120-02012.
- [6] UNEP 1991, “*Environmental impact Assessment: sewage treatment plant for Port Said.*”
- [7] Haydar – 2009, “*Evaluation of Drinking water Quality in Urban Areas of Pakistan. A case study of southern Lahore*”, Pak J. Engg and Appl sci vol 5, July 09 (P 16- 23).
- [8] Zulfiqar – 2009, “*Low cost Municipal waste water Treatment Options for use in Pakistan – A Review*”, Science vision, vol. 15 No.1-2009.
- [9] Pak-EPA/DECC study, “*Urban Environmental problems in Pakistan – A case study for urban Environment in Hayatabad, Peshawar.*”
- [10] Mussarat et al – 2007, “*Concentration of metals in sewage and canal water used for irrigation in Peshawar*”, *Sarhad Journal of Agriculture*, vol 23, No.2, 2007.
- [11] Murtaza – 2010, “*Wastewater Production, Treatment and use in Pakistan*”.
- [12] Khan et al – 2012, “*Drinking water Quality and Human Risk in Charsada district, Pakistan*” *Journal of Cleaner Production* xxx (2012) 1-9.
- [13] Murtaza et al – 2010, “*Disposal and use of sewage on Agriculture lands in Pakistan; A Review*”, www.elsevier.com/locate/pedosphere.
- [14] Anwar et al – 2012, “*Open Drainage and poor drainage system damage the Health of Slum Residents; A case study of Hamatiyan, Bahawalpur, Pakistan*”, *Sind univ. Res Jour (Sci. ser)* vol 44 (1) 53 – 58 (2012).
- [15] Ahmad et al – 2013, “*Effect of sewage water irrigation on uptake of some essential minerals in Canola: A potential forage crop for Ruminants*”, *Pak. J. lifesoc. Sci* (2013), 11 (1): 42-47.
- [16] Sheikh et al – 2012, “*Effect of sewage water on cauliflower productivity in Punjab, Pakistan*”, *Journal of Agriculture and social sciences*, 2012.

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