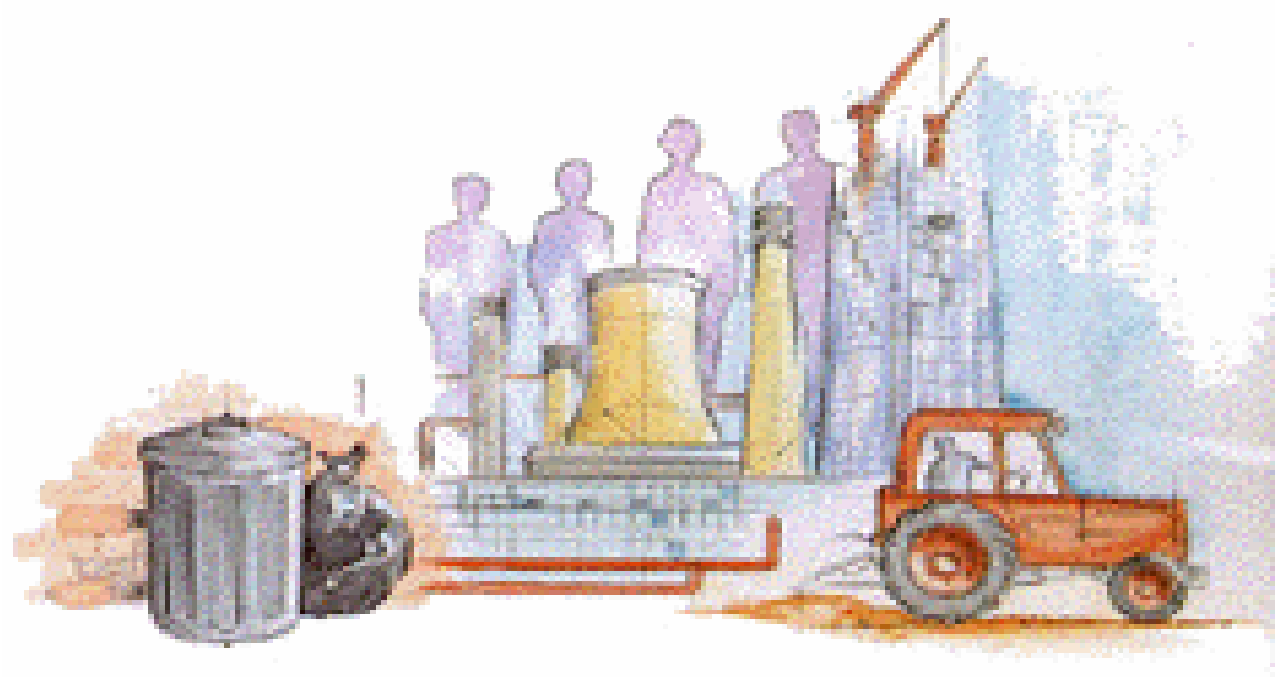
REPORT ON KARACHI WASTE MANAGEMENT

"A CHALLENGE FOR PROGRESS"



COMPILED BY

ENVIRONMENT STAKE HOLDERS' ACTION COMMITTEE

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MESSAGE FROM SENATOR NISAR A. MEMON

In the 20th century, our society has sought wealth and economic growth, and has seen many significant changes, especially in overall wealth and the quality of life. However, this growth has come at a high environmental price, and we are now witnessing destruction of the ozone layer, global warming, and waste disposal problems, as well as extensive land and water pollution - all of which are taking their toll on the delicate environment of our planet. If the 20th century was characterized by industrial and economic growth, the 21st century is one of environmental awareness. To survive and progress in 21st century, countries must reconcile the often diametrically opposed goals of economic development and environmental protection.

This is why President General Pervez Musharaf's team is now seriously promoting sustainable growth and implementing an environmental management program. The Government has long recognized the importance of sustainable development and the objectives in the last seven years have always closely interlinked the three aspects of economic prosperity, environmental protection and social equity.

The real world in which we live is complex and challenging – as is the achievement of sustainability in economic, environmental and social issues. The world is confronted with dramatic environmental challenges, which could threaten future economic development and even social life on the planet. The major threat to the life of the human community is represented by climate change, and there is now a growing and generalized consensus on the decisive role of human activity played by the emission of greenhouse effect pollutants. As a member of the United Nations Global Compact, I am very pleased to issue our first Environmental Report. This Environmental Report is based on the recommendations of our first Stakeholders Round Table Meeting (SRTM) organized by my Karachi Secretariat on 21st December 2006. Various stakeholders representing City, Provincial and Federal Government, as well as Academicians, Navy, NGO's and industry to address the challenges of Waste Management, attended the SRTM. The SRTM gave us an opportunity to look back and make a status of our achievements. It provided us a perspective of Waste Management of the Karachi city and we discussed the issues, problems, challenges, suggestions, ideas and recommendations by the stakeholders. It also identified current cost effective practices that

reflect global and regional experiences of economically and environmentally sound waste management capable of replication. It also defined the crucial role of Industries, NGOS and Governments in the management of waste.

Encouraged by this success, we formed Environment Stake holders' Action Committee (ESAC), under the chairmanship of young entrepreneur Mr. Ziad Bashir. The committee aimed at preparing comprehensive recommendations in a report form. The ESAC held its several meetings in a short period of about one and half months and has prepared a comprehensive report which could be bench mark for not only Karachi but also for the other cities of Pakistan.

The report is designed to help readers easily understand Karachi's environmental issues, the changes and improvements that we need in this city. The Environment Stake holders' Action Committee (ESAC) and I are fully committed to continually improve our city's environmental performance in any way that we can. Any comments or opinions regarding our environmental conservation efforts and the environmental report are greatly appreciated.

Senator Nisar A. Memon

MESSAGE FROM MR. ZIAD BASHIR

The sustaining of economic growth while keeping a check on environmental degradation is an issue that many developing countries face. Environmental challenges are being brought to the forefront more so than ever before, and now is the time to clearly identify the issues that need to be addressed and create policies and initiatives to address them.

After studying the environmental landscape of the city, it has become increasingly evident that drastic measures need to be taken if we care to leave this city, its beautiful coastline, and its scenic surroundings to our next generation of citizens. Are we going to be looked upon as the generation that sat back and watched Karachi decline into a near wasteland or are we going to be remembered as the generation which acted in time and made Karachi a regional example of environmental best practices.

It is for this reason that the Environment Stakeholders Action Committee (ESAC) has been formed. The ESAC was formed at the end of 2006 with the commitment to improve the environmental situation of Karachi, and providing a framework that would be easily followed by the other cities. The ESAC has prepared the following detailed report identifying and addressing the city's environmental problems especially related to waste management and providing recommendations for short and long-term solutions.

To achieve our goals we will have to work together closely with the government departments, public/ private organizations, and NGO's, plus simultaneously collaborate with international forums and organizations. The first step in the right direction has been taken by Senator Nisar A. Memon by calling a round table meeting to highlight these critical issues. I would like to appreciate his efforts and above all thankful to the contributions of ESAC members who have helped to put together this report. With our strong commitment of solving city's environmental problems, we are able to compile this detailed report in a short period of 6

weeks during which we met four times to finalize our recommendations and future strategy along with action plans to work practically on environmental cause.

Ziad Bashir
Chairman ESAC

EXECUTIVE SUMMARY

Waste management is an important part of the urban infrastructure as it ensures the protection of the environment and of human health. It is not only a technical environmental issue but also a highly political one. Waste management is closely related to a number of issues such as urban lifestyles, resource consumption patterns, jobs and income levels, and other socio-economic and cultural factors.

The present report gives a brief review of the development of the waste sector since the 1992 Rio Earth Summit as well as a status description of the situation of waste management today and of future challenges. The scope of the report is not only limited to the management of municipal solid wastes (MSW) but also liquid and industrial waste.

The waste management situation in the countries around the world is by no means uniform. It is easy to forget that the category of countries that are now "fine-tuning" their waste management systems is a minority. The vast majority of countries are busy struggling with such basic issues as ensuring sufficient collection services and implementing a minimal degree of control at disposal sites at the same time as they are facing increasing waste amounts due to the trend of urbanization. They also lack the technical and financial resources to safely manage solid wastes - which includes adequate provisions for storing the waste at the point of generation as well as efficient and sufficient collection services. Final disposal in those countries is usually a matter of transporting the collected wastes to the nearest available open space and then discharging them.

However, important progress has been made in the waste sector over the last few years. The most important improvement is the increased level of awareness among both the public and politicians. This is the first step to ensure that action is taken and resources are allocated

accordingly. On the other hand, the availability of resources is closely connected to the economic situation and waste management still holds a weak position in this context compared to other public services. Since economic development is also closely linked to the generation of waste, the last couple of years with strong economic development have resulted in increasing waste quantities.

It has become more common to use different instruments to reach environmental targets. Legislation plays an important role in establishing the framework for these targets; it is complemented with a number of market based, economic and information related instruments. Their application and effectiveness depends on the situation. During the last 10 years, new communication technologies and networking have played an increasingly important role in the process of sharing know-how and experience across borders.

One major drawback for the waste management is the difficulty to get acceptance for the setting of new waste treatment facilities. The NIMBY-syndrome (Not in My Backyard) makes the setting of facilities lengthy and costly all over the world.

The most important challenge for a city like Karachi is the prevention of waste, followed closely by the need to obtain clear, transparent and reliable data. Another task is the increased cooperation across all the stakeholders to achieve the overall goal of improved resource management and to render waste less hazardous. Solutions for those two goals will have to be found in the conception, design and production phases of goods.

Senator Nisar A. Memon has taken an initiative on Karachi's Environmental Issues after the informative sessions arranged for the parliamentarians by Consumer Rights Commission of Pakistan (CRCP) and called a stakeholders' roundtable meeting on 21st December 2006. Elected representatives, government officials, NGOs, academicians and industrialists attended the meeting. Concept papers, presentations, technical literature/ information was shared among the stakeholders and during the meeting it was felt that the initiative taken by Senator Nisar A. Memon is a right step at this crucial stage in Karachi where we are going on rapid expansion in all sectors.

An Environment Stakeholders' Action Committee (ESAC) under the chairmanship of Mr. Ziad Bashir was formed with a responsibility of formulating recommendations to meet the

environmental challenges especially waste management for Karachi. ESAC has taken this challenge very seriously and in one month they met four times and finalized their recommendations in a comprehensive report which could be a bench mark for not only Karachi but also for the other progressive cities of Pakistan.

This environmental report includes SRTM's proceedings including technical presentations and concept papers by the experts/organizations. The second part of this report is the recommendations of ESAC, which shall be considered by the Governments at all levels. Governments should immediately make an action plan based on these recommendations at their levels so that the objective of doing this work shall be accomplished.

This report has been compiled from different sources of information, including research papers, websites, books, newspapers, environmental magazines and literature. The source could be provided on request.

Stakeholders' Round Table Meeting

STAKE HOLDERS' ROUND TABLE MEETING

The Round Table Meeting was held at Pakistan Institute of Management, Karachi on December 21st, 2006 by the initiative of Senator Nisar A. Memon. The main objective of arranging this meeting was to realize the importance of environmental issues associated to Karachi and provide a platform to all the stakeholders to discuss and share their concerns, experiences, suggestions and recommendations.

In his welcome address the Senator emphasis the need for better working relations among all the stakeholders for the betterment of Karachi city. Following are excerpts of Senator Nisar A. Memon's speech.

Ladies and Gentlemen, I welcome you all to this first Stakeholders' Round table Meeting. The purpose of the meeting is to have an overview on the Waste Management of Karachi City and to discuss the causes, consequences and solutions to Waste Disposal.

All land, waste and environmental management practitioners in Karachi need to be aware of the changing implications for waste types and how this will affect current waste disposal practices in the City. Individuals should understand clearly the assessment requirements needed to identify potential hazardous properties set out in the Hazardous Waste Directive, and how existing and future disposal practices may then need to be reconsidered.

In today's society, households and industries are producing an increasing amount of waste. Waste management - waste prevention, recycling, reuse and improving final disposal and monitoring - is aiming at reducing the production of waste and at treating waste for sustainable development.

Waste management has high environmental priority – on the Karachi city level as well as on national level. In Karachi, at present, waste management is mainly limited to waste disposal. Actions for

improvement are needed, and there are opportunities for co-operation in business and transfer of know-how. Developed and developing countries already have shown that they are among the leading countries in environmentally friendly and economically competitive waste management systems and treatment technologies.

As you all know that Karachi is the only mega city of Pakistan bearing the population of more than 160 million. The meeting will discuss the issues, problems, challenges, themes suggestions, ideas and recommendations by the different segments of society. In addition, the meeting will look into the broader scope of city's environmental perspective.

The aim of this meeting is to bring all the stakeholders of the city like representatives of Governments, Parliamentarians, representatives of Political parties, representatives of business and Industry related to waste management issues, researchers, and NGOs and to discuss the issue to seek a possible solution. The meeting will provide knowledge about Karachi situation, information about possible project funding, discussions about concrete project ideas and opportunity to seek potential collaborators.

The meeting was tailored to the needs of stakeholders interested and issues involved in the challenges of Waste Management. It had 3 sessions:

- Presentations session: 10:00 a.m. to 11:30 p.m., presentations, slide shows and or movie.
- Discussions session: 11:50 p.m. to 1:30 p.m. The facilitator collected the suggestions, recommendations from repertoires.

- Press Briefing: 2:30 p.m. to 3:30 p.m., summarization of the meeting and final words.

It was decided to compile those ideas, suggestions and recommendations, which were come from different sessions of the meeting. These would be summarized and that also published in report form. The repertoires noted down all the proceedings of the conference.

All the participants who attended the meeting introduced themselves; they range from elected representatives, government officials, representatives of NGOs and educational institutes and office bearers of different business and industrial chambers and federations. The complete list of participants is hereunder:

LIST OF PARTICIPANTS:

A. ELECTED REPRESENTATIVES

1. Mr. Malik Mohammad Fayyaz, Town Nazim Lyari
2. Mr. Humayoon Mohammad Khan, Town Nazim, Kemari

B. GOVERNMENT

3. Captain Mohammad Azhar, Commander Dockyard, Pakistan Navy
4. Mr. Pervaiz Ali Khan, Federal Ministry of Environment
5. Mr Javed Ali Khan (PECP), Federal Ministry of Environment
6. Mr. Abdul Kazi Kabir, Program Director, SDSSP, Government of Sindh
7. Mr. Syed M. Yahya Senior Sc. Officer, Sindh-EPA
8. Mr. Khalid Javed Divisional Officer, CDGK
9. Dr. Nasir Ali, SDSSP, Government of Sindh
10. Mr. Muhammad Khalid, SDSSP, Government of Sindh

C. BUSINESS AND INDUSTRY

11. Mr. Ziad Bashir, Chairman, Landhi Association of Trade and Industry
12. Mr. Majid Aziz, President, Karachi Chamber of Commerce and Ondustry
13. Mr. Saboor Ahmed, Senior Vice Chairman, SITE
14. Mr. Rafiq Tabani, Tabani Group
15. Mr. Abdul Shakoor Khatri, Chairman, Standing Committee on Foreign Investment

D. NGOs

16. Mr. Roland D. Souza, SHEHRI-CBE,
17. Dr. Ejaz Ahmad, Deputy Director General, WWF
18. Mr. Nasir Ali Panhwar, IUCN-Pakistan,
19. Mr. Jawad Habib Javed Akbar Associates
20. Mr. Farhan Anwar SHEHRI-CBE,
21. Mr. G.N. Mughul, Project Manager, CRCP
22. Mr. Ibrahim Patel, Plastic Industry
23. Mr. Siddiq Mirza, , Advocate Supreme Court
24. Mr. Mustafa Abbasi, Special Assistant to Chairman Senate Standing Committee on Defence and Defence Production
25. Mr. M. Hanif Rinch Pakistan Overseas Employment Association
26. Dr. Moazzam Ali Khan, Chairman Environment Science Department, University of Karachi
27. Ms. Nargis Latif, Managing Trustee Gul Bahao
28. Mr. Farhat Ali Khan, The Reformers

After the introduction of participants, the chairman, Senator Nisar A. Memon started the first session of the meeting. This session was about presentations and paper reading Captain Mohammad Azhar, Commander Logistics, Pakistan Navy gave the first presentation. His presentation was about Marine Pollution. It was a very impressive presentation in which Captain Azhar categorically described the present status of marine pollution and how it is damaging and affecting the sea life. He also said that he is virtually the victim of the pollution, which is causing a severe blow to the marine environment. The pollution, which is coming unchecked through Malir and Lyari rivers, is deteriorating ships and naval equipment. In his recommendations, Captain Azhar emphasized strict check on marine pollution, as it will affect our defense.

Ms. Nargis Lateef from Gulbahao gave the second presentation. In her pictorial presentation she emphasized the need of recycling and reusing of waste. She recommended encouragement of scavengers, and waster collectors and recognition by the Government as an Industry.

Mr. G.N. Mughul from CRCP read paper on “Engaging Parliamentarians on Environmental Issues”. In his paper he described the catastrophic loss of environment due to mismanagement in waste collection and disposal. He also talked about water pollution that is indirectly related to borne diseases to large amount of arsenic in water. He gave the example of Hepatitis B and C and Gastro in this regard. He said large number of people in Hyderabad and in Faisalabad became sick due to water pollution. He further said in his paper that Indus is the sixth largest delta but unfortunately due to unchecked sewage water mangroves are dying. He recommended that Government should make environment its top priority, parliamentarians should be sensitized, government officials should take interest in environment, educate and aware masses.

Dr. Moazzam Ali Khan from Environmental Science department, University of Karachi, gave his views about different types of waste and their prevention. He said we should not hesitate in importing latest technology, but before that he said we should understand the importance of waste segregation and its disposal accordingly. Biological, chemical, hospital, hazardous and domestic waste should dealt separately.

The fifth presenter was Mr. S.M. Yahya, Senior Scientific Officer, Sindh-EPA. In his presentation he emphasized on the need of new and modern landfills for Karachi. He said there should be separate landfills domestic and industrial waste. He further said that Katchi Abadis along the Lyari and Malir rivers and our coast is in great danger. We could have a

tsunami like situation if our coast is eroded and mangroves are killed due to waste problem. He also said that we don't have any scientific way of collecting data and the waste management plan is limited to some areas. In his recommendations he said that there should be standard laws for disposition of waste. We must have Data Information System, proper segregation and scientific landfills.

Dr. Ejaz Ahmed from WWF was the sixth presenter. His presentation was about natural habitat and its destruction due to marine pollution. In his short presentation, he said millions of tons of waste goes to sea every year unchecked and destroys marine life.

Mr. Majyd Aziz, President Karachi Chamber of Commerce and Industry was the last presenter. In his paper he said that with the help of public hearing and message conveying all the stakeholders should be educated about the sensitivity of this problem. He further said that Industrial sector is also suffering from waste management issues. In his recommendations he said there should be separate waste management bodies for all five industrial associations. Water should be recycled and reused. Laws should be implemented. Media should take part in public mobilization. Environmental education should be given at all levels in every institute of the country.

The second session was general discussion by the participants. Every participant was given 3-5 minutes to give suggestions and recommendations for the better of situation. At the end of the meeting, Senator Nisar A. Memon summarized the SRTM and recommendations were compiled distributed among the participants.

Recommendations

By

SRTM

RECOMMENDATIONS GIVEN AT SRTM:

- Need to protect mangrove forest because of its protection values for the city.
- Water pollution should be reduces and this polluted water van be used as a source of support to marine life instead of a problem /nuisance.
- Land use plan should be developed to ensure that natural resources are protected.
- Karachi is the big city it needs a new-designed landfills.
- Two-stage garbage disposal system should be implemented, i.e. from the site to local segregated, compact facility and then to bring tit to the landfill.
- Stern action on legislation and execution of the laws.
- Increase and mobilize resources.
- Mega city projects should be stopped for instance.
- Available Policies should be made principal guideline.
- Effective mechanisms for implementation of laws.
- Floating particles should be checked through putting grid/screen chamber on Lyari River.

- SDSSP should be made bench marking for all stakeholders for water and sanitation issues.
- Funding could be generated through spending money from private sector and institutions like World Bank, and other donors.
- Spaces of green zones like islands on roads could be used for commercial farming, like growing flowers and this could be done on BOT basis.
- Evolve the entire Stakeholders' including young people and women.
- Save Indus Delta.
- Institutional mechanism and a board should be made including all stakeholders.
- Brain storming on regular basis of all the stakeholders.
- Turn environment into the business.
- To training programs should be made by taking all the stakeholders into confidence.
- There should be a company made with public-private partnership for looking and solving the problem industrial affluent water.
- The processes should be made simple for creating a system for the confidence of industry.
- A campaign on National level to protect our dry and wetlands.
- Waste management in developing countries must emphasize and be linked to the creation of jobs, poverty alleviation and community participation.
- National policies should promote efficiency in the use of resources, emphasizing waste prevention and the productive use of wastes.
- Rural-urban alliance for food-nutrient exchange.
- Find alternatives to land filling
- Services and programmes that include proper waste disposal for management of hazardous biological and chemical wastes, minimization and recycling will be needed
- Clear government policies and competent bureaucracies for management of solid wastes are needed.
- Promote educational campaigns for (a) environmental and societal benefits of waste reduction and recycling (especially as individual economic incentives weaken), (b) composting options c) reducing the stigma attaching to waste work;
- Study waste streams (quantity and composition analyses, by income groups); recovery/recycling systems; markets for recyclables, and problems of existing

practices to decide where there may be a facilitative/regulatory role for the municipal authority;

- Support source separation, recovery and trading networks, Including NGO projects, with information sharing (especially of market data) and engagement of important stakeholders;
- Facilitate small enterprises and private-public partnerships by: new or amended regulations for co-operatives, loans to businesses, amendment of counter-productive zoning and tax regulations, enable space for sorting and trading depots, etc.;
- Reduce harassment of itinerant buyers, pickers and waste dealers by police; assist waste pickers to move out of manual picking through retraining programs or subsidization of sorting/redemption centers;
- After consulting the major stakeholders, advocate, if feasible, selective waste minimization legislation: pressure national levels for packaging reduction, product redesign, and coding of plastics;
- Examine the needs of near-urban farmers for organic matter and support safe waste reuse in urban agriculture; reduce or remove high subsidies of chemical fertilizers;
- Encourage export of recyclables if there is an economic demand in nearby
- Make or amend laws
- Media mobilization
- Create an environmental website
- Make a Volunteers' committee comprising from provincial Govt. A. Kabir Kazi, SM Yahya from SEPA, Farhan from Shehri, Ziad Bashir from Business, Mirza Siddiq from lawyers, Dr. Moazzam from education, Capt. Azhar Pak Navy, Nargis Lateef from ladies and Khalid Jawed from CDGK, while Mustafa Abbasi will act as a Secretary of the committee. The committee will be called Environment Stakeholders' Action Committee ESAC and will be chaired by Mr. Ziad Bashir.

Environment Stakeholders' Action Committee (ESAC)

ENVIRONMENT STAKEHOLDERS' ACTION COMMITTEE (ESAC)

This Action Committee was formed on December 21, 2006 after the Stakeholders Round Table Meeting with an agenda to formulate recommendations to meet the environmental challenges especially waste management for Karachi. The ESAC with the commitment to improve the environmental situation of Karachi is providing a framework that would be easily followed by the other cities. The ESAC has prepared the following detailed report identifying and addressing the city's environmental problems especially related to waste management and providing recommendations for short and long-term solutions. Following are the Committee members who contributed a lot in compiling this comprehensive report:

1. Mr. Ziad Bashir (Chairman, Landhi Association of Trade and Industry)
2. Mr. Siddiq Mirza (Advocate Supreme Court)
3. Captain Muhammad Azhar (Pakistan Navy)
4. Ms. Nargis Lateef (Managing Trustee GulBahao)
5. Mr. Khalid Javed (CDGK)
6. Mr. G.N. Mughul (CRCP)
7. Mr. Farhan Anwar (Shehri – NGO)
8. Mr. Mustafa Abbasi (Secretary to ESAC)
9. Mr. Saboor Ahmed (Vice Chairman, SITE)
10. Mr. Rehan Rizvi (Chairman's representative)

This report provides significant information about Karachi's environmental status; however, its scope is limited in several ways. First, the report focuses primarily on the city; it does not address international environmental conditions or issues that may affect environmental quality in this city. Second, the report provides information on status and condition, about waste management issues but it may does not describe many other important problems faced by environment.

It provides the Environment Stake holders' Action Committee's (ESAC's) response to the questions related to environmental concerns, with the aim of sparking a broader dialogue and discussion about how to answer them in the future. The report has two key purposes:

- To describe what ESAC knows—and doesn't know—about the current state of the waste management at the city level, and how it effects the environment.
- To identify measures that can be used to track the status of and trends in the waste management and to define the challenges to improving those measures.

This report is the first step in ESAC's Environmental Indicators Initiative. This initiative seeks to develop an improved set of environmental recommendations that will enable Stakeholders to better manage for results and better communicate the status of the environment and human health.

An important next step in ESAC's initiative will include working closely with partners—other federal agencies, provincial, local government, non-governmental organizations, and the private sector—to create a long-term strategy for developing an integrated system of

local, regional, and national indicators. This report is issued as a draft to stimulate dialogue and invite input into developing and improving environmental measures in the future. ESAC welcomes your suggestions about how well this report communicate environmental status and trends and how to better measure and manage for results.

WORKING WITH PARTNERS

Protecting the environment and human health is not ESAC's task alone. Many federal and provincial departments implement legislation and manage programs that contribute directly to those goals. Many other factors influence human and environmental health: individual choices, collective actions by citizens, and decisions made by industry all contribute to the health of society as a whole, and of its surrounding environment.

In developing this report, ESAC learned much from the experiences of others: the Federal Environmental Protection Agency, Pakistan Navy, Sindh EPA, Sindh Devolved Social Services Program, NGOs like, Shehri, Gulbahao, IUCN, WWF, CRCP, educational institutes and of course our industry sector. This draft report is much stronger as a result of the comments, advice, and data they made available to ESAC.

INVITATION TO A DIALOGUE

ESAC invites your participation in the discussion about this report. We welcome your suggestions, the future directions for ESAC s Environmental Indicators Initiative, how best to measure and manage for results, and how to effectively communicate about environmental status and trends to the public.

Introduction to Waste Management

ABOUT WASTE MANAGEMENT

Background

“Waste” is broadly defined as unwanted material left over from manufacturing processes or refuse from places of human or animal habitation. Within that category, are many types of waste including municipal solid waste, hazardous waste, and radioactive waste, which have properties that may make them dangerous or capable of having a harmful effect on human

health and environment. Waste and contaminated lands are particularly important to environmental health because they may expose land and living organisms to harmful material if they are not properly managed. Preventing pollution before it is generated and poses harm is often less costly than cleanup and remediation. Source reduction and recycling programs often can increase resource and energy efficiencies and thereby reduce pressures on the environment Increased recycling protects land resources and extends the life span of disposal facilities.

MSW, commonly known as trash or garbage, is one of the nation's most prevalent waste types. These other types of waste contribute a substantial amount to the total waste "universe," although the exact percentage of the total that they represent is unknown.

Other Types of Waste

- Industrial effluent
- Nuclear waste
- Extraction wastes
- Industrial waste
- Household hazardous waste
- Agricultural waste
- Construction and demolition waste
- Medical waste
- Oil and gas waste
- Sludge

Waste management involves the storage, collection, transport and disposal of waste, which is generated in the home, commercial premises and institutions. As such, it comprises an extremely complex set of operations that has to take place on an enormous scale; Karachi in Pakistan generates upwards of 8000 Tonnes daily.

Good solid waste management is an important component of a strategy for improving environmental health. In addition to the obvious aesthetic importance of a garbage-free living environment, uncollected solid waste rapidly putrefies in tropical climates, creating noxious smells, providing breeding areas for countless flies and, in the wet season, mosquitoes. A particularly important indirect effect is the blocking of drains, which causes local flooding

with its associated environmental health risks and economic threats. Yet to date, solid waste management has received scant attention from external support agencies.

UNDERSTANDING HOW SOLID WASTE MANAGEMENT WORKS?

Whose responsibility is it? City and town and union councils are charged with solid waste management; it is usually the Municipal Department, headed by EDO Municipal services, which has lead responsibility. The Engineering Department maintains the vehicle fleet, and may provide inputs if service contracts involving the private sector are involved. Given the size, complexity and budget share, it remains surprising that dedicated solid waste management departments are very rare in municipal government.

What happens to municipal waste? Only about 30 % of waste is collected by CDGK, rest is either managed by cantonments or disposed off by individuals. Householders either deposit their waste in a communal container, or leave it in small piles outside the house. Municipal sweepers, who take it to a larger waste transfer point, from where it is lifted and transported to a disposal site, possibly via another intermediate transfer point, remove it. The collection frequency of the waste varies from daily upwards, depending upon the resources available and the perceived importance of the locality in question.

Who works in municipal solid waste? The municipal sweepers are organized into a system of 'beats' i.e. length of street, and there is a hierarchical system of supervision in the Health Department which is usually based around council/corporation Wards (the key functional unit in urban local government). Vehicle crews are under the overall control of the Transportation Officer, who assigns their pick up routes.

Matters are further complicated by the fact that municipal sweepers enter into informal contracts with households for the removal of waste, some of which is sold on. Some households enter into agreements with private sweepers (i.e. persons not in the employ of the municipality) for cleaning and the removal of household waste.

Is there any waste recycling/reuse? The composition of solid waste entering the municipal waste stream indicates that (in contrast to Europe and America) there is very little paper, plastic, glass or metal; it is mainly silt (from road sweeping) and organic vegetable matter. This is because solid waste is an important resource, and as a result there exists a highly

developed and complex system of waste recovery, reuse and recycling which operates on a commercial basis.

This is not a system which has been developed by the public sector, nor is it an environmental hobby; it is market based and market driven. Itinerant waste buyers purchase recyclable items door-to-door from householders or their servants; this material is sold on to middle dealers who may specialize in certain types of waste. Finally, there are the waste processors. Estimates given in the studies show that this 'informal' industry could provide employment for up to 40,000 people in Karachi. At the micro-level, there are particularly complex intra-household relationships involving women and domestic servants that have gender implications. There are also large numbers of waste pickers who are not part of the formal system, who make their living from picking out material for reuse/recycling from communal bins, transfer points and waste disposal sites. These people may be amongst the poorest of the poor.

Are there other enterprises associated with solid waste? In addition to waste reuse/recycling, there are many cases where residents have taken initiatives to improve the primary collection of solid waste from their neighborhood. Rich and poor alike pay for additional waste services. Area based organizations and NGOs have played important roles here and the basis is some form of local enterprise. This may involve municipal sweepers being paid extra, local activists either facilitating or managing collection, or a small contractor providing local services.

Thus solid waste management comprises a whole range of activities involving the public sector, small-scale private enterprises and service users.

Recommendations
By
ESAC

LAWS AND IMPLEMENTATION

Realizing the environmental effects over civil society, the federal Government in the year 1983 introduced law known as Pakistan Environmental Protection Ordinance, 1983. Under this law by way of academic pursuit, National Environmental Quality Standard (NEQS) were formulated. Since the formation of NEQS, Federal Government took no concrete or tangible steps, meaning thereby lack of *Governance.* For promotion of sustainable development and improvement in the environment related measures, the Government in the year 1997 enacted Pakistan Environmental Protection Act, 1997.

In order to involve the stakeholder in the implementation of social welfare laws the concept of Environmental protection council has been incorporated at the Federal Level consisting of Prime Minister its Chairman, Minister Incharge of the Ministry as Vice chairman, Chief Minister and Provincial Minister as its Members. There are other 10 Members to be taken from various Government departments; twenty members shall be non-official members and 5 members from chamber of commerce and industry. These members are to be taken from Agriculture, Medical, Legal Profession, Trade unions, NGO's, Scientists and Educationists. This parent body has been tasked to: -

a) Co-ordinate and supervise enforcement of the Provisions of this act.
b) Approve comprehensive national environmental policies and ensure their implementation within the framework of national conservation strategy as may be approved by the Federal Government from time to time.
c) Approve the national Environmental Quality Standard.
d) Provide guidelines for the production and conservation of species, habits and biodiversity in general, and for the conservation of renewable and non-renewable resources.
e) Co-ordinate integration of the principles and concerns of sustainable development into national development plans and policies.

In the Environmental Law of 1997, two permanent bodies like Federal and Provincial Environmental Agencies to perform the functions under the act and to implement the policy decisions of the council.

FINANCE

In the Environment Laws there is concept of establishment of Provincial Development Fund. The sources for generation of Fund are: -

a) Grants or loan by respective Governments.
b) Aid and assistance / donations from foreign governments, International / National Agencies. Contribution from NGO's, private Organizations and philanthropists citizens.

The management of the Fund is with official Members. The Funds administration has been source of discontentment in the stakeholder circle.

RECOMMENDATIONS

1) The non-official Members of Federal Environmental Council is appointed on the recommendation of stakeholders. The meetings of the Council are held at Provincial level at quarterly basis.
2) The qualifications for appointment of Federal or Provincial Director Generals be prescribed by Environment Council. Short listed candidates for such posts are submitted to the Council for its approval.
3) In the promotion of environment programme, active involvement of International Donor Agencies is paramount policy turn out under the present scenario.
4) Enhanced National Budgetary allocation be made to the promotion of Environment Scheme / Policies
5) The Workers Welfare Fund is aimed at improving their social status by way of providing, housing recreation, health incentives to the industrial workers. The utilization of these funds is allocated to the Provincial Environmental Agencies. Out of 2% allocated funds, one third can be utilized for promotion of standards in the industrial Pollution. This requires just issuance of notification by Federal Government.

LANDFILLS

At present CDGK is operating following two-landfill sites in the city.

1. Jam Chakro Landfill site near Sarjani Town measuring 500 Acres Land (in the North of City).
2. Gond Pass Landfill site near Tapal Energy Plant on RCD Highway measuring 500 Acres land (in the West of the city).
3. A third Landfill site in the East of the City at Razzaqabad is under process.

The Jam Chakro Landfill site has been developed on Semi Aerobic type. The development of Gond Pass landfill site on Semi Aerobic type is under process. The development of these landfill site on Semi Aerobic type is made as these landfill sites will cater only municipal waste.

Both the landfill sites as mentioned above are 35 Kilometers from city center. The hauling distance for one garbage vehicle comes 70 KM (Up & Down).

The transportation of 8000 tons of solid waste daily to the existing landfill sites (Up & Down distance 70 Kms) by the existing vehicles (Capacity 4 to 6 tons each) is neither possible nor economical.

PRESENT SITUATION

Out of 8000 tons of garbage generated daily in the City following reaches at the landfill.

1. Jam Chakro Landfill Site — 2000 Tons per day
2. Gond Pass Landfill Site — 1500 Tons per day
3. Un official Dumping at Landhi / Korangi — Unknown

It is estimated that about 50 % of the garbage generated in the city is not shifted to official landfill sites and being dumped at open plot or at slump areas.

SOLUTION TO THE PROBLEMS

- Two stages transportation system of garbage, which is practiced in, developed countries and being followed in developing countries in necessary for the Mega Cities like Karachi.
- Garbage Transfer Station (GTS) are generally installed at different location in the city so that the primary collection vehicles travels only 3 to 4 Kms and dump their garbage in the GTS.

- In GTS garbage is weighed, sorted (optional), compacted to reduce the volume and transported to the final disposal site in long chases collection vehicles.

BENEFITS OF THE GTS

- The hauling distance of primary collection vehicles is only 3-4 Km thus number of trips increase by 4-5 trips per day (up to GTS) where as at present these vehicles make only 1-2 trips up to landfill site (70 km up & down).
- Due to increase in number of trips by primary collection vehicles the lifting capacity will be double.
- GTS stops the haphazard and random dumping of garbage by smaller vehicles at places where they find convenient.
- Larger vehicles have no other option but to go to dumping site where garbage-unloading facility is available.
- Provides better control and monitoring of the vehicles involved in collection while being an economical alternative.
- Provides environment friendly way to transport waste through closed containers upto final disposal site.

SUMMARY OF COST

(For one GTS with compaction system)

Following are the cost involved for this option:

- Civil Costs Rs. 125.00 Million
- Mechanical Costs Rs. 240.00 Million
- Total Capital Cost Rs. 365.00 Million

INITIATVES TAKEN BY THE CDGK

It is planned to established 7 Nos. Garbage transfer station having capacity of 1000 Tonnes/ Day each (for 8 hours Operation).

Following four sites have been selected for installation of GTS.

- Mewa Shah
- Gulshan-e-Iqbal, Behind Aziz Bhatti Park.
- North Karachi
- Korangi

CDGK has appointed consultant to design the environment friendly GTS. The Concept clearance paper (CCP) for establishment of 5 Nos. of garbage transfer stations has been submitted by CDGK. The CCP was cleared by the Government of Sindh and was forwarded to Government of Pakistan for clearance of CDWP at Islamabad.

CDWP has linked the establishment of garbage transfer station scheme with the waste to Energy plant. The correspondences made in this regard are attached.

RECOMMENDATIONS

It is requested that this forum should take up this issue and request the GOP to lining this project from waste to Energy Project.

The waste from industries may have many hazardous items, which cannot be dumped, in the landfill sites developed for Municipal Waste. Therefore, the waste from industries should be treated separately. The landfill sites for industry waste require special lining and necessary developed separately as per their requirement.

PUBLIC PRIVATE PARTNERSHIP

CDGK has taken initiative to have Public Private Partnership in transportation of Garbage from generation points to landfill sites.

In February 2006 all the 18 Towns Municipal Administration (TMA) have out sources the transportation of garbage from generation point to landfill sites.

PRESENT SITUATION

It is mentioned here that due to the absence of Garbage Transfer Stations at convenient distance from generation point of garbage, the contractors have to transport the garbage up to landfill site. Due to long haulage distance the private contractor could not produced the require result. At present only 5 TMA are continuing with the above system and remaining have terminated the contract.

The operations and maintenance of Jam Chakro landfill sites is already privatized. Private contractor is responsible for operations and maintenance of the landfill site for one year. The operation and maintenance of Gond Pass landfill site will also be handed over to the private contractor in February 2007.

FUTURE PLANNING

After establishment of garbage transfer station at different locations in the city following activities can be out source to the private contractor.

- Door-to-Door collection
- Road Sweeping
- Primary Transportation of Garbage from Dustbin to G.T.S.
- Operation Maintenance and secondary transportation of Garbage from G.T.S. to Landfill Site.
- Operation and Maintenance of Landfill sites.

- Private Sector will be invited to install any feasible plant at Landfill sites to generate the revenue.

REDUCTION, RECYCLING AND RE-USE OF WASTES

WASTE MANAGEMENT STRATEGY:

The entire strategy should be geared towards “Shrinking of the Kachra Kundis”. i.e. fewer and fewer items should enter the garbage dumps. This can only be done if the principal of separation at source is applied. When less and less wastage will have to be removed there will naturally be a saving of vehicles, their petrol and their maintenance.

LEGISLATION

1. Children’s pampers are one of the biggest hurdles and these must be discouraged.
2. Shopping bags should not be thrown around indiscriminately.
3. Garbage burning should be stopped for forthright.
4. Fresh and sweet water should not be used in lawns gardens, parks and nurseries, Gutter water, should be used instead.
5. Factory effluents should not be allowed to enter rivers and seas.

LIVESTOCK FROM WET GARBAGE

The media especially the Sindh media, KTN and Sindh T.V. must explain to the people the importance of organic waste to agriculture and animal husbandry. It should be explained to the people that religion forbids waste and even the vegetable waste should be handled with care, i.e. either given to livestock or used for organic fertilizer.

Wet garbage should not be thrown on cemented ground. Instead it should be thrown on unpaved land without plastic bags. Sites should be reserved in the cities especially for grazing of livestock called “Chara Ghar” Over here separated vegetable and fruit, pulls may be collected on plastic sheets to keep them in good condition.

Every town must have a “Chara Ghar” where lambs and sheep may come to graze. Here there must be enclosures of some kind where each animal may be charged for grazing. These charges would help in the overall maintenance of the enclosure. Timings of the enclosure should be between 6:00 a.m. to 8:00 p.m. Livestock raring may be inextricably connected with the organic wastes that is coming out of the cities and which is more than 50 % of the total waste.

RESEARCH

New items in wastage are being introduced frequently. Thanks to rapid industrialization. Cottage industries and informal sectors have become very innovative as far as recycling goes. “ Machar Colony” and “Godara Colony” are two places where a good deal of the city’s wastage is being collected, both and sold. The “Machar Colony” deals with shopping bags while “Godara Colony” deals with all kinds of textiles.

An information pool may be made to show what kind of wastage is being bought and sold. Linkage between waste management and cottage industry can be improved with the introduction of research workers from different discipline of science and arts.

An NGO like Gulbahao has succeeded in making building blocks and pre-fabricated housing from shopping bags and other industrial waste. The housing industry and other could learn from this research which will have a deep impact on both environment and construction industry.

FACTORY EFFLUENTS

Factory effluents may be used to grow biomass or trees. Apart from dilution, chemicals may be put into them to neutralize their toxicity. Since the wood will not be used for eating purposes there will not be any danger to human beings even if the wood contains high levels of toxic substance.

Research workers and academicians from the universities and colleges must be encouraged to conduct research work on different aspects of recycling and reuse of waste management and utilization.

RURAL-URBAN ALLIANCE

When 50 % of the world's population lives in cities that occupy only 2.5 % of the Earth's surface and they use some 75 % of the world's resources, you can imagine the enormous task in managing the wastes that these cities generate. Wastes include under-utilized materials that human beings are unable to use to generate a product of a higher value than the cost of disposal or treatment.

Wastes come in different forms and concentration of water, chemicals and radioactivity. Some of these are hazardous and pose health risks to humans and other living forms. Others are unwanted because human have not yet found a use for it or because the material accumulates in very large amounts. These different types of wastes need to be handled and treated in different ways.

The availability of clean water in cities is one of the pressing problems that Karachi faces. Because of its growing costs of production and its scarcity, the transport of clean water into city to flush human wastes out of the city is clearly an approach that has become inappropriate for the city in the future.

Alternative systems need to be implemented in eco-city. In recent years, increased human resources and financial inputs have been given to ecological sanitation. For countries that pioneered to demonstrate and implement small projects, they are moving into large and village/town level demonstrations as a multi-purpose strategic alternative to the need to construct large and centralized sewage treatment plants. The need for small on-site wastewater treatment systems will also be more common. Urine can be collected separately

and used safely after long-term storage as a fertilizer. The management of the solid portion of human wastes is however a major challenge technologically especially in high-rise buildings.

A manual handling approach to the problem will face a social-cultural resistance. There are dry toilet technology (such as compost-, wood ash- types) and systems and this need to be adapted to suit eco-city structures and lifestyle or vice versa. Uses/sinks for treated/stabilized feces will be needed, e.g. highway green belts where human contact in minimal or exported into the rural areas. Technologies to reduce/eliminate health risk exist (e.g. solar pasteurization and dehydration) and this may lead to products that can incorporate nutrients derived from human wastes for indoor and outdoor gardening. However, there is still strong opponents/concerns and socio-cultural objections to re-use and the preference to disposal to avoid dealing with health risks.

In a city like Karachi, the organic fraction is high. Household garbage is 80 % or more organic matter. City can process and recycle bio-organics to produce energy (biogas, heat) and soil conditioning materials (compost) but there will be excess. The city needs an "urban-rural alliance" to export organics out of the city to achieve a balanced material flow. The concern is how rural areas can gain from this alliance. The use of recycled organic products can help to counter this and at the same time reduce accumulation of organics in the city. The rural-urban alliance means that separated organic fraction from garbage and their organic carbon and nutrients can be recycled into agricultural products that are ultimately return to cities again. However people who believe that cities are doomed to degradation and diseases and that landfills are "mines" in the future, also believe that the rural-urban alliance is just a trick by cities to 'dump trash' on farmers. Claiming that the urbans are doing the rurals a favor is a new twist on that same old story.

Advocates for urban organic wastes need to explicitly demonstrate the purity of their product, the balanced nutrient value of their product, and the intermediate conditions of each stage in the storage/processing of the so-called "fertilizer" waste stream. International organic farming regulatory organizations require this now.

The health aspects in the reuse of organics are a concern especially from heavy metals contamination. At the same time there is a need for clear guidelines for the quality of a

product for different uses in specified situations. This is particularly important for products or wastes that are associated with human wastes.

There are good examples of and opportunities for successful reduction, re-use and recycling of urban solid wastes that can be conducted within eco-city limits. There is also a growing number of actions/solutions for hazardous wastes. The level and gap of action however is wide. Appropriate and innovative approaches/systems are urgently needed in Karachi; these will most probably be different from those in industrialized countries.

There is increasing evidence that community-based approaches to waste management can promote a more sustainable development. Grassroots efforts can be more successful than top-down programs created by bureaucrats or experts with little or no community participation. During most of human history, the approach to waste management in many cultures and civilizations was the recovery of materials. Only around the turn of the twentieth century the emphasis shifted from recovery to disposal. During the nineteenth century there were pioneering efforts in England to minimize wastes as a way to improve industrial competitiveness.

WASTE WATER TREATMENT / DISPOSAL

THE CURRENT SITUATION

KW&SB, the main formal service delivery institution, faces a crisis rooted in a lack of accountability, transparency and operational autonomy, legal ambiguities, a dysfunctional governance structure, technical inadequacy, tariff imbalances and financial bankruptcy. Following are discussed some relevant issues that would help define the current situation in the sector.

Water supply and sanitation service delivery levels in Karachi are very poor with serious economic and social costs to the city and the citizens. Households connected to the KW&SB network in Karachi receive water only for three to four hours per day. Intermittent water supply has severe public health consequences, as clean water in pipelines becomes contaminated in the absence of sustained water pressure. High levels of leakages/water theft (30%) in the network make contamination more severe.

About 70% of the water supplied to the city returns as sewage. A total quantity of 315 MGD of domestic and toxic industrial wastewater is generated in the city. There are three sewage treatment plants in Karachi. The combined design capacity of these treatment plants is 151 MGD. The untreated sewage is disposed off in sea through nallahs, including the Lyari River.

The total length of sewers is 3,500 miles and ranges from 8” to 66” diameter of trunk sewers, secondary sewers and laterals.

In the absence of proper network at places sewage has been diverted to storm water drains, Lyari/Malir Rivers, Gujar Nallah, Orangi Nallah and other tributaries. There are a large number of Katchi Abadis where more than 40% of the city’s population lives. The population of the city for which the system was originally designed has exceeded the design capacity. Consequently the sewerage network is overloaded and is rendered undersized in a number of areas.

In case of municipal waste water treatment, the three sewage treatment plants are functioning at 20-30% efficiency, mainly because the majority of the sewer pipes (secondary/ trunk sewers are not connected to the plants with the result that hydraulic loading is insufficient. Lack of trained staff employed for operating the plants and meeting the requirements of fulfilling the O/M procedures/ practices and crisis management is another inhibiting factor. Insufficient financial resources that hinders proper maintenance and upgrading of the plants

KW&SB investments in the past have mostly augmented production and transmission, neglecting efficiency improvements, rehabilitation and maintenance. Networks and facilities have therefore deteriorated, inefficiencies and losses have made operations wasteful and financial capacity constraints have prevented investment planning based on an integrated view of capital expenditures, operation and maintenance and least cost principles.

Absence of a systematic policy or regulatory framework makes it difficult to hold KW&SB accountable for its performance. KW&SB is still managed in terms of the KW&SB Act of 1996, but it also functions under the conditions of the Sindh Local Government Ordinance (SLGO) of 2001, which has marked implications for its place within the broader devolution process and its relative relationships with the provincial, city and town level governments in its area of jurisdiction. The KW&SB Act of 1996 provides for a Governing Board that has barely met over the past few years.

KW&SB has limited control over influencing tariff re-adjustment and there is no independent regulation of tariffs. In the absence of an effective tariff structure and a process of tariff setting that considers economically rational operational factors, there has been no incentive for greater efficiency or for customers to pay. KW&SB’s relationship with consumers also

needs much improvement in order to mobilize public support for action against illegal connections, encroachment of pipelines and other malpractices that undermine operations.

Nearly 30 MGD of water is being provided to industrial sites located at S.I.T.E, Korangi, Landhi, F.B Area, North Karachi and elsewhere in the city. However, none of the industrial estates in Karachi are served with effluent collection and conveyance system. So the effluents are not collected and conveyed to the KW&SB treatment plants and instead are discharged mostly untreated into the sea via the Malir and Lyari Rivers.

Some industries do employ in-house wastewater treatment practices but their effluents are not treated in the KW&SB treatment plants. About 70% of the total industry of Pakistan is located in Karachi. Most of the Industry is located in Sindh Industrial Trading Estate (S.I.T.E), Landhi Industrial Trading Estate (L.I.T.E), Korangi Industrial Area, West Wharf Industrial Area and the Hub Industrial Trading Estate (H.I.T.E).

INTERNATIONAL BEST PRACTICES

The reforms in the public utilities recently carried out in Johannesburg, South Africa, Phnom Penh, Cambodia, Manila, Philippines and Uganda offer a range of options that have worked and can serve as reference points for selecting the most viable reform options for Karachi.

RECOMMENDATIONS

Following are discussed some short, medium and long term measures to reform the water and sanitation sector in Karachi:

SHORT TERM MEASURES – Timeframe (6-12 months)

Profiling the Water & Sanitation Sector

To tackle the serious and deep-rooted institutional defects, mobilization and support for change is desirable not only within the institutions itself but amongst the widest possible range of stakeholders.

Building mutual understanding in a heavily contested institutional environment is always a difficult and risky process. As a first step, documenting the de-facto situation in regards to

'who has access to what services' and identifying 'who plays what roles' can be a very useful step in promoting the understanding of 'why certain stakeholders behave in the way that they do'. For instance, the local communities have done remarkable work in improving the water and sanitation infrastructure in the informal settlements however the problem of harmonizing these systems within a network must be recognized. At the same time, the significant contribution of KW&SB in developing bulk water and wastewater resources must be recognized, especially in the context of the genuine constraints under which the organization operates.

Similarly, the role of local government representatives in representing their constituency and the associated roles assigned and executed by the different tiers of local government needs to be given due priority. The general thrust of such an assessment being to move from the reality, to the incentives that lie behind this reality – that sustain the current status quo. Without viable governance framework that identifies the appropriate roles and responsibilities of relevant stakeholders in policymaking, service delivery and regulation, the long-term effects of technical, financial or internal management changes cannot be secured.

A number of studies are presently being undertaken by a number of organizations such as ADB, JICA, WSP etc. however none of the study is proposing generation of primary data on the sector and are instead relying on secondary data, much of which is outdated and at times also lacks authenticity. It is therefore proposed to conduct a comprehensive exercise of primary data collection for the entire sector, whether formally or informally managed in terms of infrastructure development, financial contributions, legal and policy issues etc. Such data to then feed into the future planning and development initiatives that would need to be undertaken in Karachi.

MEDIUM TERM MEASURES – Timeframe (2-4 years)

Institutional Reforms

Sustainable service delivery improvements are not achievable unless effective and accountable institutions drive technical and financial inputs – clearly accountable to legitimate political authority and consumers, and with full responsibility for operational management. The water and sanitation sector in Karachi is faced with a crisis situation. The goal within the broader context should be to reform the water and sanitation sector in terms

of ensuring the institutional and financial viability of the sector and enhancing customer orientation and accountability and therefore improve the quality of life of the people.

Recently, the KW&SB management has initiated a series of reforms in areas such as revenue and operational management and improving customer services. Though highly welcome, in order to have lasting and holistic impact, it is felt that these reforms have to be embedded within a sector based reform process that targets broad based institutional reforms and the related issues of governance. A viable reform initiative would have to be based on the following important considerations:

- Achieving political commitment
- Building mutual understanding in a heavily contested institutional environment
- Identification of approaches for maximizing the capacity of all contributing stakeholders
- Ensuring the sustainability of actions

It is therefore suggested that any efforts aimed at institutional reforms should be encouraged and facilitated. Appropriate fiscal support would have to be made available for supporting the reform process.

LONG TERM MEASURES – Timeframe (5-10 years)

Following the process of institutional reforms and strengthening, the following long-term plans/projects are being identified for implementation:

- Integrated Coastal Zone Management (ICZM) Plan/Implementation for Karachi
- Rehabilitating Karachi's Waterways: Lyari/Malir River Basin Management/Planning and Implementation
- A Drainage Plan
- City Wide Sewer System/Network Rehabilitation

INDUSTRIAL SECTOR INITIATIVES

Some separate recommendations are being made for the industrial sector:

For the industrial sector, the following measures are being identified for implementation:

- Investment be directed at providing the industrial estates with proper sewerage/drainage infrastructure and an effective management system (proper collaboration b/w the industry/KW&SB-CDGK)
- Provision of financial incentives for the industrial sector to promote the installation of waste water treatment facilities
- Investment in the development of indigenous wastewater technologies/systems of wastewater treatment (e.g. industry-university liaison, capacity building of local consultants/contractors/manufactures).

AIR EMISSIONS

CURRENT SITUATION

Air pollution is an emerging environmental issue in major cities all over the world. Pakistan achieved the growth rate over 8% especially in the service sector and that result in rapid growth of infrastructure in cites together with high increase in road transport. For the last few years, due to the liberal leasing system adopted by the financial institutions, the density of transport has increased many folds on the roads of Pakistan. The present cities roads infrastructure cannot cater the need of growing automobiles flow. The result is the worsening condition of ambient air quality in Pakistan cities.

Pakistan Environmental Protection Agency (Pak-EPA) has conducted number of studies to investigate the ambient air quality in the major cities of Pakistan. The Japan International Cooperation Agency (JICA) technically and financially supported some of these studies. All these studies revealed that the number one problem relevant to the ambient air quality is the particulate matter (PM), which is extremely high in all major cities. According to the Pak-EPA/JICA investigation report, very high concentration of TSP & PM10 has been recorded and are 4.4 to 7.5 times higher then WHO Guidelines.

The second emerging air pollutant in Pakistan is nitrogen oxide. In the recent year in the world interest in NO2 as an air pollution is growing not only because of its phototoxic nature but also on account of growing evidence of its adverse effect on human health. Pak-EPA has taken lead and carried out through investigation of NO2 in all major cities (Karachi, Lahore, Peshawar, Islamabad and Quetta) to determine its present level so that the future strategy could be chased out to safeguard the public from its adverse effect. The following figures show Nitrogen dioxide (NO2) pollution in different cities of Pakistan.

In this figure mean, maximum and minimum values are given. The highest concentration of NO2 was found in Karachi and then descending to Lahore, Quetta, Peshawar and Islamabad. It reflects the high density of traffic locations in all five cities by averaging the all NO2 values; Karachi and Lahore have shown the similar average concentration of NO2 in Quetta, Peshawar and Islamabad were 69.50, 47.28 and 30.41 µg/m3 respectively. The least minimum vale of NO2 in Islamabad was found in the residential area embassy road, which was 11.65 µg/m3. The highest concentration of NO2 399.65 µg/m3 was found at Karimabad Junction in Karachi.

Transport and energy sector contributes nearly one half of the NOx, two-thirds of CO, and about one half-hydrocarbon emission in the industrialized countries. Rapid urbanization coupled with increase in population and associated transport and other provisions unplanned growth and increase in industrial sector have result in increase of air pollution problem in Karachi as observed in other thickly populated mega cities of the region. The major constituents of urban air pollution consist of Total SPM, PM10, PM2.5, Lead particulates, SO2, CO, O3, NO, NO2 non-methane hydrocarbons, and THC levels higher than normal.

BEST PRACTICES (International &/or Local) TO CONTROL AIR POLLUTION

DELHI POLLUTION CASE: -

The Supreme Court's involvement in Delhi's air pollution problem originated over concerns that the city's polluted air was slowly poisoning its citizens. A widely cited study conducted in Delhi estimates that 10,000 people die every year due to complications from air pollution. This staggering total breaks every hour. Alarmed by this unchecked pollution and its health impacts on the Delhi population, environmental lawyer M.C. Mehta, an advocate at the Supreme Court bar, filed a PIL suit in the Supreme Court against the Union of India in 1985, charging that existing environmental laws obligated the government to take steps to help reduce Delhi's air pollution in the interest of public health.

RESISTANCE FROM GOVERNMENTAL AGENCIES:

The conversion of Delhi bus fleet to CNG will require a great deal of effort and coordination on the part of the implementing agencies. The Ministry of surface Transport for the city of Delhi will have to set emissions norms for CNG, so that buses converted to CNG can be properly certified. According to the Supreme Court, the Delhi government as a whole has the responsibility to encourage public support for the CNG plan, to educate the public on the benefits of CNG, and to allay the public's concerns over transportation disruptions.

EFFECTS OF AIR POLLUTION ON HEALTH:

While several officials responsible for enforcing the Court's orders, including the Delhi Health Minister, have tried to argue that air pollution does not increase the risk of cancer, a recent study based on research conducted by the American Cancer Society from 1982-1998 proves otherwise. The study over 1.2 million participants determine that an increase of 10 µg/cum of particulate matter (PM), like dust and smoke in the atmosphere, is associated with a four-percent increase in all-cause mortality, a six-percent increase in cardiopulmonary mortality, and an eight-percent increase in lung cancer mortality. The Supreme Court of India cited the study in one of its recent rulings. Another study conducted by the Natural Resources Defense Council, a U.S. NGO, determined that the physiology of developing lungs makes children more susceptible to the health risks (asthmas, lung cancer, and respiratory infections) of PM in the atmosphere. This study went on to identify CNG as a safe fuel to help minimize the exposure of children to PM.

IMPACT OF DIESEL & CNG ON AIR POLLUTION:

Additional studies have identified the contribution of diesel emissions to the city's overall pollution levels. A report submitted to the court by the Bhure Lal Committee in 1999 concluded that ninety percent of the PM and nitrogen oxides (NOx) from vehicular emissions in Delhi come from the exhaust of diesel-powered vehicles. It became clear from these findings that developing an environmentally friendly alternative to diesel could have a significant impact on air quality in the city.

CONCLUSION:

In the Delhi Pollution case, there was a chance that public opinion may fail to support the Supreme Court if the Delhi government drags its heels, leaving the roads with fewer buses than are needed. To many Delhi residents living below the poverty line, environmental regulations are subordinate to access to basic necessities such as transportation. Did the Court's decision prove unpopular with the general public because it results in long lines and in efficient service, the Court risk losing some of the respect and credibility it needs to remain an effective instruments of change. The Supreme Court ruling to mandate the conversion of the Delhi bus fleet to CNG was a well-informed logical decision.

The Court's order was strongly backed by scientific research that proved not only the dangers of diesel air pollution, but also the economic potential and environmental safety of compressed natural gas. Furthermore, the Court fulfilled its promise as a protector of common people by refusing to yield to the Delhi government's objections, and by articulating the view that economic concerns must not outweigh the protection of fundamental rights. However, the Supreme Court's activism in the Delhi pollution case shows how difficult it was for a court even the Supreme Court to manage the environment in a nation of a billion people.

LAHORE- PAKISTAN

By presenting growing evidence of linkages between vehicular emissions, air quality and health, residents of Lahore began the struggle against air pollution in 1997 by approaching the High Court for orders to help curtail and reduce vehicular emissions. The petitioners pleaded their constitutional Right to Life and prayed for proper enforcement of laws, for development of alternative fuel strategies and for thorough inspection and maintenance programs to be deployed by respondent state functionaries. In order to resolve the issue in an

amicable and consultative manner, the Lahore Clean Air Commission (hereafter referred to as "LCAC" or "Commission") was constituted on 24 July 2003 under the Chairmanship of Dr. Parvez Hassan and counted amongst its members, representatives of the local government, environment protection agency, transport department, traffic police, civil society and lawyers.

Presently the LCAC has branched out into sub-committees that are looking into the highly scientific aspects of air quality management such as clean fuels, transport sector regulation and two-stroke vehicles. The work of these sub-committees is to be consolidated into the Committee's draft report to the High Court and will contain recommendations for reform of air quality management. Based on the recommendations of Committees/ Sub-Committees, various bold actions had been taken and implemented by the Lahore City Government.

MEASURES FOR IMPROVEMENT OF AIR QUALITY IN KARACHI CITY

Following are some of the general suggestions that are deemed necessary to control and manage the continuously increasing air pollution in Karachi city and Sindh Province:

POLICY & STRATEGIC INTERVENTIONS

1. Development of import policy for used/old vehicles with prime focus on environmental issues.
2. Development of vehicle registration policy for vehicles to be operated in the metropolitan areas.
3. Development of an integrated working hours schedule for public and private sectors for reducing the traffic congestion peaks in the city.
4. Strategic measures for production of air pollution control devices (filters etc.) through local industries.
5. As a strategy for reduction of air emissions, the industries that have very high emission rates (such as power plants, cement industries, etc.) may be provided, as an incentive, some rebate in taxes if they acquire and operate appropriately pollution control devices in their industries.

6. Similarly, industries with well-established Environmental Management Systems i.e. if Air Emissions from their facilities/ plants are under NEQS limits; should be provided with special incentives/ tax relief.

SHORT TERM AND LONG TERM ACTIONS

1. Implementation of Section 15 Pakistan Environmental Protection Acts 1997. This section prohibits plying of motor vehicles with emission exceeding the limits specified in NEQS. EPA's are empowered to implement this section with consent of Environmental Magistrates. Back in year 2000 the competent authorities have nominated the first Judicial Magistrate of each district in the Province as Environmental Magistrate. With all legal tools available, the non-implementation of this section is beyond understanding. EPA staff in coordination with traffic police may proceed with the implementation of this law and it would also neither require any heavy financial resource nor any technical expertise.
2. Development of vehicular emission testing stations at petrol pumps with coordination of retail companies (PSO, Shell, Caltex, TOTAL) for low cost but standard testing services. Currently, emission-testing services are provided at very few locations. For effective enforcement of law there should be enough testing stations at appropriate locations to facilitate the vehicle owners. Otherwise all campaigns, awareness schemes and enforcement actions would be fruitless if there are not enough testing stations in the city.
3. Smoothening of road surfaces, filling of ditches &trenched and removal of all potential hazards from the roads that would cause traffic congestions would be an effective strategy for improving the ambient air quality. It is the traffic congestion which causes abrupt rise in air pollutants and impact adversely on health of human beings residing or commuting in the affected zone.
4. Restriction on plying of small and medium size busses on identified busy corridors. Only large busses must be allowed to operate on such corridors. However, as a long term strategy plans to be made for establishment of rapid mass transportation system on busy corridors.
5. Energy conservation procedures to be implemented in large private and public sector industries and establishments on priority basis. It is a well proven statistic that around 25 to 30% savings in electricity bills may be achieve with some very basic conversation

steps staring from ‘schedule of lightening system’ to ‘control of air-conditioning’ to ‘efficient equipment usage’.

6. While involving the training institutes and academia, the government should facilitate SME’s to adopt and implement environmental management system.

OTHER RECOMMENDATIONS:

- Vehicle inspection & Examiner department should be strengthened by the provincial governments in consultation with Ministry of Transport, provincial EPA to ensure good condition / tuned vehicles on roads.
- Establishment & implementation of weigh bridges on all important highways & roads to check over-loading.
- Policy / Pricing structure be re-organized for conversion of dirtiest fuel (diesel) on road transport to clean fuel i.e. CNG instead of gasoline conversion to CNG, i.e. provision of disincentives against diesel driven vehicles.
- Fuel substitution strategy can be improved if a) LPG supplies from domestic refineries be increased, b) find alternate import sources for LPG / natural gas through pipeline from neighboring countries.
- Fuel substitution policy needs more encouragement and special incentives/ tax relief on CNG kits & equipments, CNG operated buses / trucks be exempted, lucrative bus routes for CNG, lower slab of road tax for CNG vehicles etc.
- Introduction of government subsidized urban mass transport system with large fleet using clean fuel would reduce the traffic burden from city roads / hot spots and as a result improve urban air quality in these cities.

AWARENESS, TRAINING, EDUCTAION & MEDIA MOBILIZATION

COMMUNITY-BASED WASTE MANAGEMENT:

A growing population and an increase in urban commerce and industry have given Karachi a serious waste problem. Solid waste management has been identified as an important issue and while attention has traditionally focused on the provision of infrastructure, facilities and equipment, alternative approaches merit consideration. These include the promotion of waste reduction, reuse and recycling.

ASSESSMENT:

To deal adequately with the garbage produced daily in Karachi, the city needs a well-organized, well-funded waste management programme and infrastructure. In view of current economic conditions, this goal is not likely to be achieved in the short term. The mobility of many of the inhabitants of Karachi is one of the reasons why it is hard to ensure adequate management.

For the majority of Karachi's residents, waste is viewed as a commercial and industrial problem, rather than a household and community problem. Aesthetically, the problem of garbage may be understood, but rarely does this transfer to an appreciation of the environmental repercussions of improper waste disposal. Giving proper awareness to the community on impact and importance and effectiveness of waste management will help in managing, reducing and separating wastes at source according to the health and safety legislation. Media should take a lead in this direction and start campaigns at each level of community. Participation of community in waste management is must.

ENVIRONMENTAL EDUCATION:

With thousand tons of rubbish both solid and liquid being thrown into Karachi's Arabian sea everyday, it is clear that the problem of waste management is not simply a matter of garbage collection, but also of public education. Education in alternative practices, especially for those living around the sea will help reduce dumping of waste into the sea.

SCHOOL PROGRAMMES:

Environmental education is not common within the country’s school systems, but like many new areas of study it does not receive the necessary funding and training required. Environmental education essentially involves many areas of study, from natural sciences to

history and philosophy. It is most successful if integrated into existing subjects rather than as an independent or optional course.

The Ministries of Education both Federal and Provincial should have integrated programmes to develop greater environmental awareness at the school level. The programmes consist of two components:

(1) A broad-based environmental curriculum:

Where the environment is incorporated into existing subjects and the subject content is uniform nationally.

A local environment programme (in this case Karachi), which includes specific environmental subjects based on the local area. Its content varies from one region to another, and it is planned to implement it throughout Pakistan.

The programmes must be carried out with adequate resources and budgets, and have consequently better impact. Teachers and provincial management units must be trained.

Environmental education must include formal and informal modes. UNESCO can offer assistance with both avenues – firstly, by contributing environmental education modules to a task force examining the national curriculum, which is due to change in 2007. Secondly, assistance can be given through informal education activities, which will add a new dimension.

In order for environmental education to be successful in schools, the teachers themselves must first be taught. UNESCO can propose to offer an in-service workshop for teachers in Karachi and in the whole country. This would include an extra two days at the teachers' annual general meeting to provide the tools, and training on the use of the teaching resources, as well as to create a support network for environmental education among the different towns of the city.

Besides incorporating environmental topics into the teaching of other subjects, at the high school level there is a need to develop focused studies to combat coastal environmental destruction. Such a programme should provide general background information on the interrelationship between urban activities and coastal environmental quality, and specifically the following:

- The natural and urban environment in the coastal area, and the consequences of environmental, social, and economic changes
- People and the coastal zone, including those living in urban and rural areas of the city, and people living in small islands (Baba, Bhit, Dengue and Badaal)
- Karachi Metropolitan Area growth patterns and impacts on coastal environmental quality
- Water quality in the Karachi Metropolitan Area
- System hydrology
- Urban solid wastes
- Urban ecology in the Karachi Metropolitan Area

(11) Informal Education Programmes:

Informal field and action-orientated activities are an important education mode, which can complement formal school programmes. Some field courses should be organized for young people, the objectives of which are to:

- Apply knowledge of coastal regions, small islands and associated systems, through the analysis of existing problems
- Promote interaction between high schools
- Encourage the collection, recording and dissemination of information relating to the environment year by year
- Encourage the implementation of standardized monitoring and protocols to enable the consistent collection and use of data

EDUCATION AND PUBLICITY

Waste management program cannot succeed without a strong public education effort that provides general information about waste and specific instructions about how to participate in managing waste. This education also might benefit the community by reducing the quantity of waste collected in subsequent programs.

TARGET THE AUDIENCE

Residents are the most important targets of a waste education program. Information about waste also should reach to all the stakeholders like public representative, officials, civic groups, solid waste personnel, and the business community to encourage financial support, donations of in kind services, or other assistance. The media is an especially important

vehicle; media understanding of waste issues helps ensure accurate and responsible reporting. Educators need resources to develop and communicate a strong understanding of the issue to the people they teach. Manufacturers, retail stores, school chemistry departments, hospitals, agricultural extension services, and farmers also can benefit from education about waste management.

EDUCATION THROUGH THE MEDIA

Well-prepared media handouts-feature articles, public service announcements, and other materials for the press. Information about waste management can be presented in a variety of ways. For example, a radio broadcast on a regular basis might feature a hazardous waste expert who can answer phone-in questions on waste management. Local television stations can cover a tour through a home with an environmental expert, who can discuss the products that can become waste and how to manage them safely.

INFORMATION AND REFERRAL SERVICES

A publicly advertised local telephone hotline can encourage people to call for information about managing waste, and also can facilitate a waste exchange/referral service. These services can be effective but require telephones, office space, training, and personnel.

MAILINGS AND MAILING INSERTS

Utilities, banks, bills, and advertisers may be willing to include waste announcements and informational literature in their regular mailings. Inserts mailed with water bills, garbage bills, or tax bills not only provide information about waste, but also can educate the public about the links between waste generation, waste management, ground-water protection, and water/garbage rates. Community groups can include educational information about waste management in their mailings or newsletters. Waste program sponsors can send direct mailings to people who participated in previous waste collections.

POSTERS, HANDOUTS, AND BROCHURES

Flyers and posters can be displayed or handed out at schools, educational institutes, markets, libraries, community centers, and offices. Businesses can post signs and notices for shoppers and customers on how to safely manage household products that might become waste. Real estate agents can offer their clients information about waste with their other community

resource materials. Solid waste facility personnel at drop off landfills, transfer stations, and recycling centers can discuss waste and provide written information when residents drop off waste or recyclable. Handouts can include waste "wheels" that highlight the potential hazards of household products and suggest less hazardous substitutes.

GARBAGE CAN LABELING

Some communities distribute plastic adhesive labels that residents can put on their trashcans. The labels alert people to the potential hazards of mixing waste with their trash, list products containing hazardous constituents, and advertise where to dispose of waste properly.

DISPLAYS/EXHIBITS/AUDIO VISUAL PRESENTATIONS

Public education staff can use slide shows, Video presentations, and hands-on exhibits at community group meetings, county fairs or other special events, public information sessions/ workshops, shopping malls, and other public forums. Banners with waste management education will work well for some communities.

SPEAKER BUREAU

City District Government should has access to knowledgeable speakers who can make presentations to local groups at a nominal fee or free of charge. Sources for community education experts include cooperative extension services, soil and water conservation districts, and health and solid/hazardous waste administrators.

POINT-OF-PURCHASE INFORMATION

Information about the potential hazards of household products can be distributed where the products are sold. For example, hardware stores can distribute handout on what to do with used motor oil, paints or varnishes.

WORKSHOPS AND CONFERENCES

Workshops, presentations, and conferences on managing waste can bean excellent way to bring information to citizens, waste program volunteers, local business groups, and community officials.

PRESS-READY ADS PUBLICIZING THE WASTE MANAGEMENT

Newspapers and radio and TV stations might run these ads free of charge on a space-available basis, or local firms might sponsor them. Local groups, such as civic groups, public agencies, schools, local media, and businesses, often are willing to help with publicity and outreach. A local advertising agency or public relations firm might agree to plan or produce the publicity campaign. Invite the firm to participate on the planning committee.

ENVIRONMENTAL ROUNDTABLES

Roundtables bring together key citizens and business leaders in the area to talk about waste reduction issues on a regular basis. They offer opportunities for education, information sharing, waste exchanging, and support. Often groups are formed about a specific industry or type of business such as hospitals or school districts, or by issue such as reuse, packaging, or compost.

THINK TANKS

CURRENT SITUATION

A think tank is an organization, institute, corporation, or group that conducts research, typically funded by Governmental and commercial clients, in the areas of social or political strategy and technology. The success of environmental programs depends greatly on the awareness and consciousness of the people. A National Environmental Awareness Campaign on national level can be launched to sensitive people to the environmental problems through audio-visual programs, seminars, symposia, training programs etc. In order to do all this effectively, we'll need assistance from specialized focus groups in the field of environment, volunteers, academicians, environmental scientists and above all NGO's etc.

In Pakistan, with the support of national and provincial governments, various formal and informal committees/ sub-committees are working for the environmental issues and pollution controls along with various NGO's who are also practically involved in this work through financial assistance from international and national donors but whatever is being done is not handled through a centralized source and at moment is disorganized.

Federal Ministry for Environment has to take a lead role and it shall ensure that all working related to environment at various levels i.e. national level, provincial level, city governments, NGO's and Public- Private Focus groups etc. must be reported to them. By having an environmental data bank at federal level will help in achieving our goals and objectives related to environmental management systems all over the Pakistan and we can get benefits by learning experiences of each other and it will expedite the progress as well and above all duplication of work will be minimized along with wastage of time by starting any project from scratch.

ROLE AND STRUCTURING OF THINK TANKS

An integrated effort is required in environmental planning, management and action. Interdisciplinary understanding, cooperation and coordination and increased public

participation and support are important components in the process towards sustainable development. For each core issue of environment a “think tank” shall be established that includes sector experts, academicians, social scientists, administrators, government’s official, NGO’s representatives, political activists and private sector individuals/ volunteers.

The think tanks shall be constituted as independent bodies with consulting role and powers with necessary authority. All these “think tanks” must be registered through Federal Ministry for Environment and shall be selected on merit for certain period. The goals and objectives of establishing a “think tank” is the most important task, as they in an advisory role should perform so that criticism of having ineffective think tanks can be avoided.

The “think tanks” shall be made at district levels/ town levels and the government must strictly monitor their performance. Because of the private nature of the funding of think tank, their results are biased to a varying degree. Some argue members will be inclined to promote or publish only those results that ensure the continued flow of funds from private donors. This risk of distortion similarly threatens the reputation and integrity of such “think tanks”.

Some critics go further to assert “think tank” is little more than propaganda tolls for promoting the ideological arguments of whatever group established them. They charge that most think tanks, which are usually headquartered in state or national seats of government, exist merely for large-scale lobbying to form opinion in favor of special private interests.

A new trend, resulting from globalization, is collaboration between “think tanks” across continents. For instance, the national level think tanks can collaborate with SAARC countries experts and apply their effective tools/ working in our cities. We should look into the studies and recommendations of regional think tanks and getting benefit of their experiences instead of re-inventing the wheel and focus our energy in finalizing strategies of implementation in our cities/ towns.

Conclusion

CONCLUSION

The ESAC would like to give the following recommendations as a conclusion of the report. These recommendations are most significant and relevant to the present environmental scenario:

- National waste policies have to be made more coherent; the legal framework, its implementation and enforcement need to be improved in all parts of the Pakistan. Especially in progressive cities and towns, substantial efforts are of greatest importance in that field.

- Waste management plans at national and local level are needed; these can serve as the basis for the improvement of and investment in waste management systems. Include Evolve Pakistan Navy, Coast Guard and Maritime Security Agency along with civil agencies in evolving Waste Management Plan for Karachi.

- EPA's role should be more active with autonomous status so that environmental goals and objectives shall be effectively monitored and implemented.

- Industrial areas shall be provided with specialized landfills to handle industrial waste including hazardous waste that must be disposed off as per international guidelines and taking care of precautionary measures.

- Tools like environmental impact assessment, material flow analysis, or macro-economic cost-benefit analysis must be applied more widely for improved and scientifically based decision-making.

- Reduction in the amount of waste generated and to decouple the link of economic growth and waste generation. For this purpose, a uniform waste industry approach to

raise public and political interest is required in all parts of the Pakistan to establish sustainable waste management systems.

- Change people's attitudes towards waste management as a whole and increase participation in recycling and minimization schemes. Once the public is participating in the recycling schemes it is important to give them feedback on what happens with the recycled waste to keep up their interest in participation. Their needs to be access to training and education for everyone involved in waste management. An increasing awareness of networking opportunities is required to facilitate the information flow.

- Improving the markets for recyclables. Producers must be encouraged to incorporate life cycle assessments in the development stages of their products and consider waste management issues in the design stages - something that does at present not happen as a general rule.

- Alternatives have to be made available so that consumers are encouraged to minimize their waste or buy products that are of a comparably high standard and price but less harmful to the environment.

- Accessible and transparent data is crucial if strategies are to be successful and sustainable waste management practices achieved. The industry needs to have access to clear, transparent and replicable data and information. The availability and the quality of waste data cause difficulties already at a city level and national level; at an international or regional level, these difficulties are even greater. The practical experience of practitioners, planners, regulators, operators, scientists and researches in waste management must be made more available to developing cities.

- Partnerships need to be developed continually so that all stakeholders can work together towards a common goal. Participation by all parties in the decision making progress is an important issue. The waste industry has to encourage and take part in multiple stakeholder involvement.