Meticulous Management of Coal Handling

Environmental Impact Assessment Report

Coal is the cheapest source of thermal energy used in industrial sector. Despite being an environmentally difficult pollutant, coal is used worldwide, including developed countries as a cheap source of energy and has played significant role in the industrial development. Countries which fail to acknowledge the importance of this cheapest source of energy continue to pay heavy energy bills. In Pakistan coal plays an important role in rejoicing the energy starving industrial sector. Here coal's share in electricity generation is 35%. Pakistan is constrained to import coal as the local coal cannot produce the required level of heat and has higher level of Sulphur. The handling of coal warrants stringent precautionary measures related to safety and environment. In this study the existing coal handling scenario at Karachi Port has been discussed with emphasis to the spread of coal dust to long distance areas. Impact identification, mitigation measures, recommendations and an Environmental Management Plan are the essence of this report.
Meticulous Management of Coal Handling

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Project: Meticulous management of 'Coal Handling'

at Karachi Port.

Client: Karachi Port Trust
Author: R. Y. Usmani
EXECUTIVE SUMMARY

Background

Coal is the cheapest source of thermal energy used in Industrial sector. Despite being an environmentally difficult pollutant, coal is used worldwide, including developed countries as a cheap source of energy and has played significant role in the industrial development. Countries which fail to acknowledge the importance of this cheapest source of energy continue to pay heavy energy bills.

In Pakistan coal plays an important role in rejoicing the energy starving industrial sector. Here coal’s share in electricity generation is 35%. The un-exploited coal reserves in Pakistan have been estimated to more than 185.5 billion tones but unfortunately the local coal cannot produce the required level of heat and has higher level of Sulphur as compared to the imported coal. Also the coal extraction needs heavy investment together with increased extraction cost.

‘Pakistan is therefore constrained to import coal.’

The handling of coal warrants stringent precautionary measures related to safety and environment.

Karachi Port Trust (KPT) has been handling coal ships for the past several years on regular basis and has adopted a coal policy to take care of environment and safety. In this study the existing coal handling scenario has been discussed with emphasis to the spread of coal dust to long distance areas. Impact identification, mitigation measures, recommendations and an Environmental Management Plan are the essence of this report.
The non-compliance with several provisions of the Policy by the coal handling entities has lead to a number of complaints from the locals and in realization of its responsibilities KPT is adopting stringent short term measures concurrent to its plans to embark upon a massive programme for construction of a dedicated mechanized coal terminal working in a dustless environment.

The present coal stacking yard is located in the east of Keamari Groyne on the land forming water front for the PDWCP’s basin. It spreads on an area over 200,000 sq. yds which for ease of identification is divided into four sections. There are several heaps of coal in each section, each heap belonging to total cargo of one ship.

The entire handling of coal from cradle to grave i.e. from coal ship to loading of trailers/railway wagons for other parts of the country is undertaken by the KPT’s licensed Stevedores.

Land for existing coal-yard which is mostly the back up area for Pakistan Deep Water Container Port, is owned by Karachi Port Trust under KPT Act.

It is proposed that through short term concrete measures, the existing coal yard may be uplifted and improved so that the adverse impacts of coal may be obviated and the entire work area becomes dust free and save for the workers in all respects.

Under the Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations 2000 the Storage and handling of coal is not mentioned in Schedule 1 or Schedule 2. Considering the disturbance caused by the coal handling processes it is deemed that the project may be placed in Schedule 2 item J-2 which reads:

‘Any other project likely to cause an adverse environmental effect’

Therefore, an EIA of the Project is required.

Implementation: EIA in entirety.

The EIA has been conducted keeping the following assertions under consideration.

i. Environment today should be cleaner than yesterday.

ii. Industrial Progress and Protection of Environment should be parallel. One should not be at the cost of other. However Health and Safety cannot be compromised for any of the two.

iii. Pakistan is constrained to import coal as 35% of its energy production is coal based and the coal produced locally does not compete with the imported coal.

iv. Almost all aspects which can have any impact on Environment, Health and Safety must be considered before deciding the viability of the project.
The EIA has drawn a Baseline Criteria which however spells out the Operational Phase EHS conditions i.e. after the coal handling has been done for several years and has resulted in heavy environmental debt.

After considering the legal aspects the Project Description has been in consonance with the EIA prerequisite. Briefly the Project is described as under.

**A.** Introduction of massive reforms seeking pronounced improvement in existing coal handling regime in the context of efficiency, safety and uplift of environment.

   This Component envisages short and mid-term measures to:

   i. Ensure strict adherence and compliance to KPT’s Coal Policy during transport, unloading, stacking and reloading.
   ii. Obviate coal dust fugitive emissions to almost zero level.
   iii. Contain and suppress the coal dust within the coal yard.
   iv. Promote consciousness among workers on health & safety, use of PPE, etc.
   v. Improve area aesthetics, landscaping and housekeeping.

**B.** Feasibility study for construction of a dedicated coal terminal with modernized dust-free loading, unloading and transportation gears.

   Component ‘B’ envisons a dedicated coal terminal capable of:

   i. Handling of coal ships including berthing, cargo discharging, cargo movement, etc. through modern mechanized equipment including covered conveyor belts, purpose built loaders, etc, all in an environment friendly manner.
   ii. Storage of cargo within prescribed parameters and in a mist laden dust free environment.
   iii. Keeping all emissions from the premises within NEQS.
   iv. Complying with all provisions of EHS policy.

The other sections of the EIA cover the i. Impact identification, ii. Mitigation measures, iii. Environmental Management Plan and iv. Conclusion/Recommendations.

The EIA report also incorporates computer modeling of Air dispersion. The modeling is based on weather data averages from the thirty years record of Pakistan Meteorological Department. However any specific wind direction and magnitude can be entered in the Software to assess the spread area of coal dust.

The Recommendations inter-alia contain following items.

   i. Adoption of a well-thought Coal Policy by KPT.
   ii. Positioning of a dedicated Traffic Officer for coal, reporting directly to Traffic Manager.
iii. Improvement in infra-structure of the existing coal yard. Provision of proper drainage system and drain water collection.
iv. Installation of mechanism/equipment for suppression of coal dust.
v. Systemized and regulated entry and exit of trucks in the yard.
vi. Improvement in Housekeeping and regular conduct of Worker’s health monitoring.

The Environmental Management Plan has been proposed to maintain the improved environment and further continuous uplift of the area with significantly enhanced safety and security arrangements.

It is expected that by adhering to all recommendations of this report and implementing the EMP in letter and spirit the issues of dust, etc can be addressed meticulously and suffice to the meeting of complaints in this regard.
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SECTION 1

INTRODUCTION

1.1 Preamble.
1.2 The Project, the Proponent, Project Area ownership, Project Alternatives and reasons for the Preferred Option.
1.3 The EIA Objectives, justification & EIA Team
1.4 EIA Methodology
1.5 Scoping & Meeting with Stakeholders
1.6 Public Consultation
1.1 PREAMBLE

Coal is the cheapest source of thermal energy used in Industrial sector. It has the potential to replace other expensive fuel such as furnace oil.

The **environmental impact of the coal industry** includes issues such as land use, waste management and water and air pollution. Whereas the land use and water pollution impacts are related to the coal mining the waste management and air pollution pertain to the coal use.

In addition to atmospheric pollution, coal burning produces hundreds of millions of tons of solid waste products annually, including fly ash, bottom ash, and flue-gas desulfurization sludge, that contain mercury, uranium, thorium, arsenic, and other heavy metals.

According to the reports issued by the World Health Organization in 2008 and by environmental groups in 2004, coal particulates pollution are estimated to shorten approximately 1,000,000 lives annually worldwide, including nearly 24,000 lives a year in the United States.

The intermediate stages i.e. transportation, storage and processing also cause significant air pollution.

Despite above mentioned facts, coal is used worldwide, including developed countries as a cheap source of energy and has played significant role in the industrial development.
Many developed countries are using the coal for the production of electricity. They are not depending on the oil or gas only, instead they are leaving these expensive sources and they are moving towards coal, nuclear and other renewable sources of electricity generation. Countries which are using coal for generating the electricity are like South Africa 88%, USA 52%, Poland 96%, China 78%, India 78%, Australia 77%, UK 37%, Germany 72% etc.

The U.S. produces more than 1 billion tons of coal each year, and more than 90 percent is used to generate electricity at U.S. power plants.

Countries which fail to acknowledge the importance of this cheapest source of energy continue to pay heavy energy bills the burden of which ultimately pass on to the common man.

In Pakistan coal plays an important role in rejoicing the energy starving industrial sector. Cement Industry was the first sector in Pakistan to switch over from oil to coal. The following chart shows that Pakistan stands high among the coal users in the region.

<table>
<thead>
<tr>
<th>Comparison of electricity generation by sources in the region</th>
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<tr>
<td>2012</td>
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<tr>
<td>----------------</td>
</tr>
<tr>
<td>India</td>
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<tr>
<td>Bangladesh</td>
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<tr>
<td>Pakistan</td>
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There are three countries in the world having sufficient reserves for next 250 years. They are Pakistan, India & China.

The coal reserves of Pakistan in Thar are estimated at 175 Billion Tons. Pakistan produces 3.2 million tons of Coal every year but mostly it is of inferior quality. Miners have to go 500 – 1000 feet deep, which ultimately increases cost of production. The local coal mines are not mechanized and this results in high production cost. Also the local coal lacks the potential. It cannot produce the required level of heat and has higher level of Sulphur as compared to imported coal.

‘Thus Pakistan is constrained to import coal’.

Pakistan imports coal mainly from Indonesia, South Africa, China, Australia and Russia. Cement makers have to use this expensive imported coal because locally available coal doesn't meet their requirements. Import of the coal started rising few years ago because of the growing demand.

As there is no dedicated coal handling terminal in Pakistan the imported coal is off-loaded mostly at the general cargo berths of Karachi Port and transported by trucks to a make-shift coal stacking yard adjacent to the Port, within the jurisdiction of Karachi Port Trust. Details of this process are discussed in Section 3 of this report.

Handling of coal has great economic attributes but associated with adverse environmental impact. This includes damage to public health, machinery, infrastructure and pathetic appearance of the area.

Although KPT has adopted a well thought policy on handling of coal, the pollution caused by coal dust continue to irritate and disturb the local workers and localities. Seeking improvement of the existing coal handling regime to uplift the environment concurrent to achieving a dust free atmosphere, KPT has decided to conduct this study.
The adverse impacts have been mitigated through adoption of stringent measures against mishandling of coal.

1.2 THE PROJECT, THE PROPOONENT, PROJECT AREA

OWNERSHIP PROJECT ALTERNATIVES AND REASONS

FOR PREFERRED OPTION

1.2.1 The Project
The Project under consideration consists of following components.

C. Introduction of massive reforms seeking pronounced improvement in existing coal handling regime in the context of efficiency, safety and uplift of environment.

D. Feasibility study for construction of a dedicated coal terminal with modernized dust-free loading, unloading and transportation gears

1.2.2  **The Proponent:**

**KARACHI PORT TRUST**

- Karachi Port Trust (KPT) is a federally administered public sector organization that oversees the operations of Karachi Port. It is responsible to the Ministry of Ports and Shipping of the Islamic Republic of Pakistan, but exists and operates as a Trust working under a Board of Trustees, legally separate from the Federal Government.

- Between 1880 and 1887 the Karachi Port was administered by the Karachi Harbour Board. The Karachi Port Trust was then established by the Act IV of 1886, effective from 1 April 1887.

- The Karachi Port is administered by a Board of Trustees, comprising of the Chairman and 10 Trustees. The Chairman is appointed by the Federal Government and is also the Chief Executive of Karachi Port Trust. The remaining 10 Trustees are equally distributed between the public and the private sector.

- Karachi Port Trust has six Divisions: Operation, Planning & Development, Finance, Administration, Engineering and Civil Works &
Estate. Each division is headed by a General Manager and supported by the Head of Departments.

1.2.2 Project Area ownership

The project area lies within the port area which is in the owner ship of Karachi Port Trust as defined in KPT Act.

1.2.3 Project Alternatives and reasons for Preferred Option

This project, related to ‘Meticulous management of coal handling at Karachi Port’ has been proposed by KPT after considering different options for storage of coal. The Alternatives included:

i. Direct delivery from ship to trucks for haulage to consignee’s premises. This is a very slow process and can delay the ship by several days resulting in extremely high overall transportation cost.

ii. Storage at open area near Machchar Colony. The vacant area is insufficient to meet the storage requirement unless the encroachment shown in this image is vacated.

iii. Construction of a dedicated mechanized coal Terminal. This option is also under active consideration of KPT. Tenders from Consultants have already been received. All tender formalities are being carried out on gallop basis. However the planned terminal would take considerable time to reach operational stage. Pending availability of such terminal for operation the working of existing storage would be improved as Part A of this project.
The uplift of existing coal yard has been selected as the options (i) and (ii) above would be cumbersome and expensive. Furthermore, the measures required to uplift the existing coal yard would be required for other alternatives also. Hence the preferred option is justified.

1.3 THE EIA OBJECTIVES, JUSTIFICATION & EIA TEAM

An Environmental Impact Assessment (EIA) is an environmental management tool used to ensure that undue or avoidable adverse impacts of the construction and operation of the project are identified, assessed and mitigated/ prevented; and that the positive impacts of the project are further enhanced.

Objectives:

The objective of this EIA process is to protect the environment in general during the implementation of the project through:

1. Predicting the nature and extent of impacts arising from the work particularly the adverse impacts on the surrounding localities and the workers engaged in the project.

2. Assessing the acceptability of these impacts.

3. Identifying suitable mitigation measures, where necessary, for incorporation into the design of the works so as to avoid, minimize and mitigate adverse impacts to an acceptable level; and

4. Designing a program of environmental management and monitoring to ensure that the impacts are kept within acceptable levels. The prominent impacts i.e. those associated with the handling including transportation and stacking of coal are all considered in this Assessment.

There are some aspects of the project which have not been included such as the environmental impact of delivery/transportation of coal to the consignee i.e. post storage period whence the environmental liability shifts to the Municipal Government as the roads used by the trucks fall under the ownership of the Municipal Govt.
Justification

*THE IEE-EIA Regulations 2000*

The Pakistan Environmental Protection Act, 1997 (PEPA, 1997) is the basic legislative tool empowering the government to frame regulations for the protection of the environment. The key features of the law that have a direct bearing on the proposed project relate to its requirements for EIA.

The Pakistan Environmental Protection Agency (Pak-EPA) Review of Initial Environmental Examination (IEE) and EIA regulations, 2000 (IEE-EIA regulations, 2000), prepared by the Pak-EPA under the powers conferred upon it by the PEPA, 1997 categorises projects for the IEE (Schedule-1) and EIA (Schedule-2).

*Justification for Placement in Schedule-2*

Under the Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations 2000 the Storage and handling of coal is not mentioned in Schedule 1 or Schedule 2. Considering the disturbance caused by the coal handling processes it is deemed that the project may be placed in Schedule 2 item J-2 which reads:

‘*Any other project likely to cause an adverse environmental effect’*

Therefore, an EIA of the Project is required.

*KPT's Requirements*

The Marine Pollution Control Dept. of KPT ensures that IEE is prepared for all projects of KPT falling under Schedule-1 and EIA is prepared for Schedule - 2 projects in strict compliance with IEE - EIA regulations 2000.
EIA Consultants

The IEE has been conducted by the Enviro-Maritime Capacity Building Institute which has done the EIA on several projects including the Pakistan Deep Water Container Port.

The Institute’s Profile:

Introduction:

Established in April 2010, the EMCBI has been quite active and has by now accomplished a number of assignments for marine based organizations, by the Grace of the Almighty. The Institute has the capacity to provide consultancy, advisory service and professional training to Organizations seeking enhanced application of best international practices related to protection of marine environment, marine operations, marine engineering, marine legal instruments, ports & harbours, etc. The Institute team excels in the environmental audit, management and monitoring including training programmes related to these disciplines.

In addition the Institute has linkages with several other professionals/experts whose project-specific availability enhances the institutional capacity to no match in the maritime industry.

Programmes & Activities:

- Consultancy and Advisory services;
- The Institute provides consultancy on projects related to marine operations including environmental considerations;
- Specialized advisory is available on oil spill response and implementation of IMO conventions; and
- The Institute conducts Environmental Impact Assessment (EIA) of marine Based projects including construction and operation of ports and terminals, single point moorings, desalination plants and coastal zone industrial units.
**Training Programmes:**

Recognising the increased importance of environmental and safety training in today’s Maritime industry which also embraces oil transportation, the institute offers top quality environmental and safety training courses including tanker safety, terminal and tankersfamiliarisation, ship-shore inspection, response to marine oil spills and introduction toIMO conventions and their application on oil transportation.

**Project specific EIA Team**

The IEE team comprised following experts.

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<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Field</th>
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<tbody>
<tr>
<td>Engr. R. Y. Usmani</td>
<td>Marine Chief Engineer</td>
<td>Marine Environmentalist</td>
</tr>
<tr>
<td>Dr. Javaid Mustaquim</td>
<td>Professor, Institute of Env.Studies,UoK.</td>
<td>Marine Biologist</td>
</tr>
<tr>
<td>Javed Usmani</td>
<td>Senior Chemical Engineer</td>
<td>Coal Specialist</td>
</tr>
<tr>
<td>MAG Siddiqui</td>
<td>Marine CE and Lawyer</td>
<td>Marine Law Specialist</td>
</tr>
<tr>
<td>Cdr. Taufiq</td>
<td>Commander, P.N.</td>
<td>Hydrographer</td>
</tr>
<tr>
<td>Mr. Fayyaz Rassol</td>
<td>M. Phil(Marine Biology)</td>
<td>Pollution Control</td>
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**Brief profile of Engr. Rashid Yahya Usmani, The EIA team leader.**

Marine Environmentalist With a cumulative experience of over 40 years in several disciplines related to marine sciences including marine engineering and marine environment he is presently the Director of EMCBI and is also teaching at the Pakistan Marine Academy. He served the Karachi Port Trust as Manager, Marine Pollution Control Department since the inception of the Department in 1995 till his retirement in 2010. A number of his environmental papers have been published in different magazines. Also he has been author of environmental reports prepared by EMCBI. With a good International exposure he has represented the Govt. of Pakistan twice at the meetings of IMO's environmental committee at London and International Oil Spill Response Conference at Miami, USA in 2005.

As Director, Enviro-Maritime Capacity Building Institute he has supervised the conduct of following environmental reports which have been approved by the EPA.

i. IEE on Rehabilitation of Berths 10-14 at Karachi Port.

ii. EIA on Reconstruction of Berths 15-17a and SRBs.

iii. EIA on Construction of Pakistan Deep Water Container Port.

iv. IEE on Env. dredging, slope protection & related works-Gizri Creek.

v. IEE on ‘Construction of Bund around Disposal ground for dredged spoil from PDWCP basin’

vi. IEE on beautification of Sand-spit beach. (Not presented to EPA as yet).
Dr. Javed mustaquim, Ph.D (zoology, University of London)

Presently a visiting professor at the institute of environmental studies, UoK, he has been the director and professor, Centre of excellence in marine biology, university of Karachi and the Dean of faculty of marine sciences, Lasbela university of agriculture, water and marine sciences. The courses taught by him at postgraduate /graduate level include faunistic studies (invertebrates), biology of invertebrates, aquatic pollution, ecology, aquaculture, marine chemistry, planktology, scientific and technical writing and coastal management.

Engr. Javed Usmani, BE (Chem)

A Chemical Engineer since 1983, He has served various chemical processing industries as General Manager. He acquired expertise in handling of coal at Al Abbas Coal Fired Power Plant, who stand among the biggest users of imported coal. He has been associated with this Institute for the past two years and has successfully conducted environmental audit of Soorti Denims mills.

Cdr. Taufiq Qureshi

Cdr. Taufiq(PN) has served Pakistan Navy for 28 years in Operation (Executive) Branch out which for 10 years onboard PN ships. He headed the National Cyclone Mitigation and Observation Cell in Hydrographic Department and has been Officer Incharge, PN Chart Depot for 12 years. He was the key person in installation of Tsunami Early Warning System in Pakistan and has conducted a number of Meteorological Courses in Pakistan. He has also been the UN Focal Person on Marine Disasters in Pakistan

1.4 EIA METHODOLOGY

For the purpose of this EIA, a systematic process to identify, predict and evaluate the environmental effects of the proposed project activities has been adopted:

(a) Scoping: key issues have been identified and stakeholders were interviewed to include their concerns and expectations in the assessment. Identification and evaluation of project alternatives and site alternatives have also been covered;

(b) Baseline survey: All parameters representing the existing environmental status have been determined. Besides, the data already available with KPT including that contained in the EIA report of PDWCP was used to establish the base line environment. Fresh samples of sediments and water were taken and analyzed at the Institute of Environmental Sciences, University of Karachi and at Quality Laboratories (Pvt) Ltd, Karachi to determine the existing baseline including the impact of coal, if any, to
determine the existing baseline including the impact of coal, if any, during the past few years;

(c) The project impact on the environment has been studied thoroughly. Major impacts include aesthetical loss, health and safety concerns, etc.

(d) Mitigation measures to prevent or minimize the potential adverse effects of the project have been studied and recommended; and

(e) Environmental Management and Monitoring plans have been proposed to ensure that the adverse impacts during the construction and operational phases are mitigated effectively or compensated through positive impacts in alternate areas.

Thus this EIA ensures that the environmental effects of the proposed development project are fully addressed together with the economic or social implications of the development.

1.5 SCOPING & MEETING WITH STAKEHOLDERS

Considering the probable physical, biological, and socio-economic environment impacts of the project on the local environment as well as communities and commodities in and around the project area, consultation was held with different stakeholders and concerned people to find their perspective about the proposed project. Accordingly meetings were organized with the said people.

Besides discussing the coal related issues with the officials of the concerned organizations/offices/entities in person, a questionnaire was handed over to them. Their comments/reply to questionnaire are presented below.
1. **EPA Sindh**

   Mr. Waqar Phulpoto, Director Technical, EPA-Sindh.

   After showing concern over the existing coal handling situation he advised to include following aspects in the EIA study.

   i. Inclusion of coal expert in EIA team.
   ii. Air dispersion modeling.
   iii. Wind breakers on boundary wall of coalyard.
   iv. Coal yard drainage system
   v. Coal segregation
   vi. Tarpaulins on transport trucks. No spillage on the way.
   vii. Heap height
   viii. Water sprinkler system

   Mr. Imran Sabir, EIA expert, EPA-Sindh, advised to include following aspects in the EIA study.

   i. Air dispersion modeling.
   ii. Public Consultation

2. **National Institute of Oceanography**

   Dr. Munnawar, DG, NIO expressed concern over coal dust but also said that this is not as big a issue as it is being projected by certain quarters. He said that by some efforts of the stakeholders, the issues can be taken care of. He suggested that KPT should plan a dedicated coal terminal so the issues are resolved once for all.

3. **Karachi Port Trust**

   Assistant Traffic Manager KGCC, KPT

   At the outset it is stated that in compliance of Honourable Court Orders the undersigned is continuously initiating number of actions under intimation to Legal Advisor KPT and ready to respond for the same at earliest.

   a) Undersigned residence is about 10 to 15 km away from Coal yard and my Traffic Manager office is about 5km from Coal Yard. The DTM(E) office is about 1.5 km away from Coal Yard.

   b) In view of constant monitoring/supervision by concerned officials, stevedores, CPSF officials, Manager Port Safety and Marine Pollution Control Department the dust and pollution is controlled and affects are negligible. Moreover, the concerned department i.e MPCD has initiated number of pollution control measures etc. The speed of dumpers has been controlled which further eliminated the chances of pollution etc.
c) The Karachi Port Trust has already advertised for dedicated coal terminal and in the meantime as per requirement of the Country the coal is handled as per industries requirements and particularly in view of non-availability of 13 meters draft at PQA.

Suggestions,

i). The different departments of Karachi Port Trust have already initiated number of measures to control the pollution.

ii). The P&D Division is already under process of dedicated coal terminal with the facility of dedicated berths, conveyor belt and dome etc. to ensure handling of coal without any generation of pollution etc.

iii). The Consultant may deeply study and take input from experts/world renowned ports handling coal with proper and anti pollution measures.

iv). Like Cement Silos at West Wharf the international modern facilities with cost effective measures may be realized/considered by the Consultant.

v). The Civil Engineers/environmentalist may be involved for having ideas i.e handling of pollution free coal.

vi). As the MPCD Department is specially created for the job, therefore, there valuable input may be obtained/shared with the consultants.

vii). A Conference with proper representation may be arranged and the ideas may be discussed and materialized.

The pollution is the main issue nowadays and the proper roads for smooth movement of vehicular traffic is required, however, in my opinion the coal has no hazards efforts to oil terminals as since last 10 years the coal is being handled at Coal Yard without any reported hazard.

4. South Asia Pakistan Terminals Ltd.,
   a) Name of Organization, Post Held and contract particulars.
      Mr Khurram Mirza, South Asia Pakistan Terminals Ltd., Manager Finance and Projects.
   b) Your association with the project and distance of your work/office/residence from the project site.
      Office is adjacent to coal terminal
   c) The impact of coal dust or related activities on your work/day to day affairs.
      Hygiene and Health issues caused due to coal dust. Machinery maintenance schedules to be effected.
d) Your views on area degradation due to existing handling of coal and suggestions towards improvement in activities and uplift of the area.

Engineering solutions should be explored and exploited to reduce/control any adverse impact of coal dust.

5. Shell Pakistan, Keamari Karachi

a) Name of Organization, Post Held and contact particulars.

Mr Adeel Iqbal, Installation Manager, Shell Pakistan, Keamari Karachi

b) Your association with the project and distance of your work/office/residence from the project site.

Shell Pakistan Installation is 500 meters away from the coal handling facility.

c) The impact of coal dust or related activities on your work/day to day affairs.

The presence of coal in this area is having a deteriorating effect on our assets, especially on our tankages.

d) Your views on area degradation due to existing handling of coal and suggestions towards improvement in activities and uplift of the area.

This handling is not only impacting the life of our assets by enhancing the rate of corrosion due to coal’s moisture absorption capabilities but is also causing a health hazard for the people working in the area and presents a fire hazard.

6. National Refinery Limited,

a) Name of Organization, Post Held and contract particulars.

National Refinery Limited, Manager, 021 32850213

b) Your association with the project and distance of your work/office/residence from the project site.

Approx 0.5 km
c) **The impact of coal dust or related activities on your work/day to day affairs.**

Coal dust affects badly on human being health, equipment, building and roads.

d) **Your views on area degradation due to existing handling of coal and suggestions towards improvement in activities and uplift of the area.**

It is suggested that handling of coal should not be executed in populated area and it must be shifted from KPT area to protect human being health and costly equipment.

7. **PSO Keamari Terminal A**

a) **Name of Organization, Post Held and contract particulars.**

PSO Keamari Terminal A Installation Manager KTA, im.kta@psopk.com

b) **Your association with the project and distance of your work/office/residence from the project site.**

No association, 2 km

c) **The impact of coal dust or related activities on your work/day to day affairs.**

Coal dust is creating breathing problems for staff. Movement of dumpers carrying coal waste traffic congestion in Oil Installation area.

d) **Your views on area degradation due to existing handling of coal and suggestions towards improvement in activities and uplift of the area.**

Severe environmental and house keeping issues are created. Due close proximity of residential area, suggest to relocate the facility or at least take action to prevent dispersion of coal dust. Proper timing of route should also be allocated for coal transportation tracks.
8. Pakistan Refinery Limited

   a) **Name of Organization, Post Held and contract particulars.**

      Pakistan Refinery Limited, Manager Keamari Terminal, 03073330129

   b) **Your association with the project and distance of your work/office/residence from the project site.**

      Pakistan Refinery is fuel refinery and it is about 0.5 km away.

   c) **The impact of coal dust or related activities on your work/day to day affairs.**

      The coal dust harmful of health especial breathing we intact coal dust which ultimately goes to our lungs it may damage.

   d) **Your views on area degradation due to existing handling of coal and suggestions towards improvement in activities and uplift of the area.**

      My suggestion is that coal activity should not be done in populated area because all area is effected. Environment gets polluted and our tanks and costly equipment damage due to coal dust painting and choking.

9. Chevron Pakistan Limited (Formerly Caltex)

   a) **Name of Organization, Post Held and contract particulars.**

      Chevron Pakistan Limited (Formerly Caltex) Terminal Manager, Tel: 32852406
      Cell # 03343659199.

   b) **Your association with the project and distance of your work/office/residence from the project site.**

      We have no such association with the project. However, anticipated distance from our work location is half kilometer.
c) The impact of coal dust or related activities on your work/day to day affairs.

As we all know that “Coal Particulates” are harmful to health, as it is continuously being inhaled while breathing, not only by our staff/workers, but by all living in this locality. In addition, it is destroying outside condition of our terminal equipment’s like storage tanks, structures, buildings etc.

d) Your views on area degradation due to existing handling of coal and suggestions towards improvement in activities and uplift of the area.

As far as our views over area degradation are concerned. We suggest removing or relocating coal stacking. And, if not then suggest KPT to build a proper facility for coal stacking as per National Environmental Standards (NEQS) which will meet all the possible safety/handling requirements and eventually help us out in overcoming or reducing this hazard.

10. Pakistan State Oil Co.

a) Name of Organization, Post Held and contract particulars.

Pakistan State Oil Co. Installation Manager KTC, imktc/psocl@psocl, 021 32850008

b) Your association with the project and distance of your work/office/residence from the project site.

No association with project. Distance approximately one km from office.

c) The impact of coal dust or related activities on your work/day to day affairs.

Facing difficulties in house keeping.

d) Your views on area degradation due to existing handling of coal and suggestions towards improvement in activities and uplift of the area.

Coal should not be stored in open areas. During transportation of coal trucks must be properly covered to avoid the coal dust.
11. BYCO Petroleum Pakistan limited

a) Name of Organization, Post Held and contract particulars.

BYCO Petroleum Pakistan limited, Manager EHS

b) Your association with the project and distance of your work/office/residence from the project site.

BYCO terminal is in the vicinity of the project area.

c) The impact of coal dust or related activities on your work/day to day affairs.

Beside our premises outside area is also very dirty and the atmosphere is laden with coal dust.

c) Your views on area degradation due to existing handling of coal and suggestions towards improvement in activities and uplift of the area

The coal must be handled in such a manner that should not effect the atmosphere not unhealthy for persons.

12. Pakistan State Oil Keamari, Terminal-B

a) Name of Organization, Post Held and contract particulars.

Name of Organization : Pakistan State Oil Keamari, Terminal-B

Name: Ashfaque Hussain

Post Held: Sr. Executive (HSE Coordinator)

Contact:- Cell Phone:- 03332747406

b) Your association with the project and distance of your work/office/residence from the project site.

KTB is Major affectee of this coal storage & movement hazard, as KTB is hardly 500 Rm away from the coal storage mounds and the entire coal carrying T/L move on the road adjacent to our western Boundary Wall.
c). The impact of coal dust or related activities on your work/day to day affairs.

The impact of coal dust or related activities on your work/day to day affairs

1). Proper cleaning of the Terminal is impossible due to extreme coal dust problem, resulting in poor hygiene and low esteem working environment.
2). Breathing problem in staff, working at KTB, is quite prevalent, due to inhalation of coal dust on daily basis.
3). Quite a few cases of chronic cough problem are also reported due to continuous inhalation of coal dust.
4). Exit routine is usually found blocked, on daily basis, due to heavy movement of coal transport trucks. It is a serious HSE hazard as emergency evacuation could not be achieved in case of any emergency and it could have devastating repercussions.

d. Your views on area degradation due to existing handling of coal and suggestions towards improvement in activities and uplift of the area.

Your views on area degradation due to existing handling coal and suggestions towards.

1). Excessive presence of coal is visible on soil, buildings, trees etc which has resulted in contamination of ambience, soil, sea etc. This excessive presence is a serious health hazard for all. Not:- This is a clear violation PEPA-97.

Remedial Measures

1). The most effective remedial measure is shifting of coal from its existing location to a location suitable for coal storage & safe coal movement. Shifting at Port Qasim area may be considered as human habitation around is comparativerly very low.


Q 1. Your share in the existing coal handling at Karachi Port, quantum of import and forecasted growth in the same in the next 5 years and 20 years.

Answer #1
At the moment we have 44% market share of the total coal imports. The growth of the company is dependent on the industry itself. At the moment there is no significant growth in the industry. With the commissioning of coal fired power plant the volume of the total market is expected to increase. The volume will increase in the following proportion:
A 600 MW coal-fired power station operating at 38% efficiency and 75% overall availability will consume approximately:
- Bituminous coal (CV 6000 kcal/kg NAR*): 1.5 Mt/annum- Brown coal (CV 2250 kcal/kg NAR*): 4.0 Mt/annum. At the moment following power plants are approved by the Government of Pakistan:

<table>
<thead>
<tr>
<th>Approved IPPs (Pvt Sector)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Station</td>
</tr>
<tr>
<td>HUBCO</td>
</tr>
<tr>
<td>Global Benefit Malaysia</td>
</tr>
<tr>
<td>Giga Energy</td>
</tr>
<tr>
<td>Yunus Brothers/Lucky Cement</td>
</tr>
<tr>
<td>Asiapak Hong Kong</td>
</tr>
<tr>
<td>Siddiqsons Group</td>
</tr>
<tr>
<td>Asia Petroleum</td>
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<tr>
<td>Mansha Group &amp; Adamjee</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>

Q 2. The discrepancies/shortcomings in cargo handling by KPT which can be a matter of concern in the context adverse impact of coal dust.

**Answer #2**
The discrepancies/shortcomings in existing coal handling can be pointed out by an expert who has visited a number of coal handling terminals around the world. As a layman we may suggest that the height of the boundary wall of coal storage area can be increased and trees can be planted to minimize the adverse impact. Sprinkling of water shall be done on regular basis using high tech machinery.

Q 3. The discrepancies/shortcomings in cargo handling by your company which can be a matter of concern in the context adverse impact of coal dust.

**Answer #3**
Awan Trading Co (Pvt) Ltd follows all precautions prescribed by the port authorities. The coal stacks are continuously showered throughout the day to minimize the adverse impact of coal dust. It is also taken into special consideration that no truck or dumper enter or exit the vicinity without being properly covered by tarpaulin.
Q 4. Your views on area degradation due to existing handling of coal and suggestions towards improvement in activities and uplift of the area.

Answer #4
We are very optimistic that if necessary precautions are taken, the adverse impact of coal handling can be controlled. Millions of tons of coal is handled around the world and most of the ports that handle coal are very congested or are in the center of a densely populated area.

Mr. Abdul Hameed Awan, the rep. of one of the major coal importers, Awan Trading Co., in reply to various questions of the EIA team members, stated as follows.

i. Whereas there are few lapses on the part of Stevedores in handling of coal, the KPT is also responsible for the mis-management of the area.

ii. The main road reaching coal stacking yard needs to be rebuilt as the unevenness of existing road results in coal spillage from truck.

   iii. The boundary wall should be kept clear of coal and a road may be built all along the boundary to provide direct access to all coal heaps.

   iv. Water is injected into the coal heaps to make up for the moisture lost during stacking.

v. The menace of coal dust has aggravated since commencement of coal stacking on the heaps of dredged spoil of the PDWCP.

vi. Night illumination of the area has been a problem since long. KPT provided the electricity but pilferage of cable became the cause of discontinuation of supply.

vii. It is difficult to clean the port road manually. KPT may consider procurement of road cleaning machines with the financial cooperation of coal stevedores.

viii. The labour was provided with PPEs but they are reluctant to use them. He was told that it is the responsibility of employer to ensure that all labour use PPEs. failing which their employment may be terminated.
1.6 GENERAL PUBLIC CONSULTATION

Name: Haji Niaz Muhammad worked for Haji Kareem Bakhsh contractor

Age: 60 years

where do you live?

Now lives in Keamari but permanent residence Mardan KPK

For how many years you are working here? and what work u are doing here?
From Four year and doing road cleaning on which coal dumpers moves.

Do you have any disease while working in coal yard?

No I do not have any disease due to coal dust.

What you think how the coal can be better handled?

Regular water spraying is done to settle the coal dust.

Name : Mr Jannat Ullah

Age: 30 years

where do you live?

Lives in coal yard and sleep on the heaps during nights and there are more than ten such peoples who are living here regularly.

For how many years you are working here? and what you are doing here?

From Five year driving the shovel.

Do you have any disease while working in coal yard?

No I do not have any disease due to coal dust.

What you think how the coal can be better handled?

If regular watering is carried out then there is no coal dust while making heaps with the help of shovels.

Name : Mr Yaseen Khan

Age: 26 years

where do you live?

Sohrab Goth

For how many years you are working here? and what you are doing here?

Shovel Operator from last one year. Worked in the area for 12 hours.

Do you have any disease while working in coal yard?

No I do not have any disease.

What you think how the coal can be better handled?
Regular water spraying is done to settle the coal dust. And there is no coal dust when we make heaps if water sprayed well.

**Name : Mr Baz Muhammad**

Age: 60 years

**where do you live?**

Lives Shireen Jinnah colony

**For how many years you are working here and what work you are doing here?**

From twelve years driving coal dumper.

**Do you have any disease while working in coal yard?**

By the grace of Almighty I do not have any disease.

**What you think how the coal can be better handled?**

Previously they were not regularly spraying water on coal heaps but now water is being sprayed regularly therefore coal dust does not spread. If it continues then there will be no problem.

**Name : Mr Arshad Hussain**

Age: 35 years

**where do you live?**

Lives at Massan Road Keamari

**For how many years you are working here and what work you are doing here?**

From five years and remain at coal yard for ten hours and have food stall here.

**Do you have any disease while working in coal yard?**

No I do not have any disease even my children helped me in selling food here they don’t have any disease. The customer also never complained about the coal. People get ill after having unhealthy food from the stall not due to coal dust.

**What you think how the coal can be better handled?**

If regular water spraying is done to settle the coal dust then there will be no problem but if they stop it then coal dust will be there.
Name : Mr Shakoor
Age: 62 years

where do you live?
lives at Massan Road Keamari

From how many years you are working here? and what work u are doing here?
From Five year selling tea in the coal yard. Open the tea vendor for twelve hours daily

Do you have any disese while working in coal yard?
No I do not feel any disease.

What you think how the coal can be better handled?
Work is going smooth. It works as it working. Peoples who drink tea here never complained any thing about coal dust.

Name : Mr Aziz
Age: 35 years

where do you live?
lives at Massan Road Keamari

For how many years you are working here? and what work u are doing here?
From Four year selling Briyani on bicycle to the workers working at coal yard.

Do you have any disese while working in coal yard?
I remian in the coal yard from ten to twelve hours and I do not have any disease.

What you think how the coal can be better handled?
Coal handlers are doing better work and regularly spraying the water on coal heaps.

Name : Mr Ibrar
Age: 25 years

where do you live?
Lives in Keamari
For how many years you are working here? and what work you are doing here?

Working here from last two years in the tea cabin and work for ten hours.

Do you have any disease while working in coal yard?

No I do not feel any disease. Usually Labours come to the tea cabin and they never complained about any disease.

What you think how the coal can be better handled?

Increased water spraying. From last two and half months now it is better. It is better if the coal is transported directly instead of storing here.

Mr. Shafiq –ur Rehman Owner of New Peshawari Hotel, Keamari

He informed that:

When coal truck moves on the road near to the hotel it become difficult to breath.

Clothes become dirty.

Customers avoid to sit on the chairs covered with coal dust therefore dusting is carried out regularly.

The tables and chairs need washing twice a day causing extra labour charges.

When Coal vessel are berthed at the port the number of person coming to the hotel increases to some extent. But the clothes of the worker are so black that other customers avoid to sit on the tables around them.

Mr Akhtar, the labour working in this hotel from last 15 years informed that he has respiratory problem due to coal dust.

Mr Haider Khan Bar boy who provides the food and tea to the offices located at Boat basin Keamari informed that his eyes sour due to coal dust in night when he goes back to his home. Now he is using glasses during his work.

Recommendations

Mr Shafiq the hotel owner recommended that coal watering should be done on coal during transportation and the proper covering of the dumpers may be carried out during transportaton of the coal.
Mr. Anwar Shah, Owner of Harbour Hotel, Keamari Boat Basin

He informed that:

The coal is dangerous for human health and its dust mixes with the food being provided at the hotel and customers usually complain to the bar boy.

Many people have been shifted from this market because it effects the business.

Recommendations

Due to stoppage of the coal vessel at the port number of customer is reduced because handling of coal is dangerous.

The coal should be offloaded at the Berth 17 or this port business may be shifted to Port Qasim.

Mr. Hanif Abdul, Owner of Passenger Boat, resident of Baba island.

He informed that:

Our business have been effected due to coal handling at Karachi Port.

All customers/picknickers/local tourist claimed that environment is very dusty at the boat basin

He requested that port authority should shift this business to Port Qasim.

Mr. Muhammad Hanif, Ex Nazim UC 4 Baba Bhit Island

He informed that:

At Keamari Boat basin there is passenger pier and visitors do not get good environment

Number of visitors/foreigners reduced

The income of passenger boat reduced and their livelihood endangered.

All the food stuff in the area is dirty the visitors avoid to eat it from the stall only locals eat them and diseases increased in them.

The residential area of PS89 including Baba Bhit, Manora and kemari is effected due to coal handling at Port.

All Mosques present in the abpve mentioned area are black due to coal. During Sajda forehead become black.
Lot of offices of the different agencies are present near the port but none of them raised voice against the coal handling. If the national flag posted on these offices become balck what to do with this type of development.

Even the KPT flag hoisted on different building become black and all buildings turn black KPT’s craft become balck due to the coal dust and lot of money is spent on their maintenance

The sewerage lines and storm drains are filled with coal dust which drops from the dumpers.

Accident also occurred during the coal transportation to upcountry.

Preventing measures

All dumpers should be properly covered and packed.

Overloading in the trucks should be banned

The coal can be imported in the plastic bags or inclosed packing.

Water should be sprayed during handling or film of the any type of foam may be spread over the coal heap.

Such interventions should be made that it looks like a model in coal handling. The vessels coming from other countries can see this model.

Coal can be handled as cement is being handled

If above mentioned points could not be possible then the coal may be shifted to the Port Qasim for better transportation to upcountry.
SECTION 2

LEGISLATIVE FRAMEWORK

CONTENTS

2.1 Environmental Policies / Plans
2.2 Legal Instruments
2.3 International Conventions
2.4 World bank’s EHS guidelines on coal processing
2. LEGISLATIVE FRAMEWORK

This EIA has been done in consonance with relevant provisions of most of the applicable legal instruments, guidelines, rules and regulations. Following instruments have been given due consideration and where possible incorporated in the mitigation measures and the Environmental Management Plan (EMP).

The proponent of this project i.e. Karachi Port Trust are committed to follow, in entirety the relevant requirements of the policy documents and legislative framework as well as those recommendations as described in the national and international guidelines for the proposed project.

2.1 Environmental Policies / Plans

2.1.1 National Environment Policies

The following relevant policies are summarized below together with their implementation pathways for the EIA:

- National Conservation Strategy;
- The Biodiversity Action Plan and
- National Environmental Policy 2005.
- Karachi Port Trust Coal Policy.

**National Conservation Strategy**

The National Conservation Strategy (NCS) is the primary policy document approved by the Federal Cabinet in March 1992. The three broad objectives of the NCS are:

- Conservation of natural resources;
- Sustainable development; and
- Improved efficiency in the use and management of these resources.

The NCS identifies 14 core areas within which 68 specific programmes are identified, each with a long-term goal and with expected results and resource investments within the next decade. Examples of these core areas which are relevant to the Coal Stacking Yard include conserving biodiversity, and preventing / abating pollution. Some of the specific programmes identified within these core areas are described below.

**Conserving biodiversity**

- Development of new wetland reserves; and
- Programmes for endangered species.
Preventing / abating pollution

- Integrating clean, low-waste technology in handling of coal and relevant machinery;
- Retrofitting of pollution abatement equipment in existing formal coal handling systems;
- Collection and treatment of wastes of stacking yard and
- Vehicle tune-up and related programmes.

Review of the NCS in 2000 concluded in approval of a National Environmental Action Plan (NEAP) by the Pakistan Environmental Protection Council under the chairmanship of the President / Chief Executive of Pakistan in February 2001.

Implementation: Impact mitigation and EMP.

The Biodiversity Action Plan

The key to protecting the biological heritage of Pakistan lies in the involvement of local people and in the support provided by a competent institution for conservation and sustainable use. The Government of Pakistan has recognized the importance of these measures in the preparation of the National Conservation Strategy and in becoming a signatory to, and ratifying, the Convention on Biological Diversity (CBD) in 1994.

The development of the BAP has been the most significant direct steps towards addressing the biodiversity loss in Pakistan.

The overall goal of the BAP is to promote the conservation and sustainable use of Pakistan's biodiversity, and the equitable sharing of benefits arising thereof, for the wellbeing and security of the nation.

Some of the key objectives from the BAP which are relevant to the coal stacking yard include:

- Objective 3: Enhance the enforcement of biodiversity-related laws;
- Objective 5: Develop and institutionalise systems to monitor key elements of biodiversity;
- Objective 7: Conserve biodiversity outside protected areas;
- Objective 11: Protect and encourage community-based biodiversity management systems;
- Objective 21: Institutionalise and strengthen EIA procedures for projects, programmes and policies; and

Implementation: Baseline criteria and impact mitigation.
National Environmental Policy 2005

The National Environmental Policy (NEP) was approved by the Pakistan Environmental Protection Council (PEPC) in its 10th meeting held on 27th December 2004 at Islamabad under the Chairmanship of the then Prime Minister of the Islamic Republic of Pakistan. Thereafter the cabinet approved the policy on 29th June 2005.

The NEP provides broad guidelines to the Federal Government, Provincial Government, Federally Administered Territories and Local Government for addressing environmental concerns and ensuring effective management of their environmental resources. It aims to protect, conserve and restore Pakistan’s environmental resources in order to improve the quality of life of the citizens through sustainable development.

The objectives of the policy include:

- Conservation, restoration and efficient management of environmental resources;
- Integration of environmental considerations in policy making and the planning process;
- Capacity building of government agencies and other stakeholders at all levels for better environmental management;
- Meeting international obligations effectively in line with the national aspirations; and
- Creation of demand for the environment through mass awareness and community mobilisation.

The Policy consists of six sections which include preamble, the national policy (goal and objectives), sectoral guidelines, cross sectoral guidelines, policy instruments, and implementation and monitoring.

A total of 29 policy guidelines relating to these instruments are proposed in the Policy.

- The policy guidelines which are relevant to the Project are:
  - Air Quality and Noise: to ensure reduction and control of harmful emissions through regulatory programmes; and to regulate vehicular emissions.
  - Waste Management: to adopt measures for mitigation of pollution caused by oil spills;
  - Biodiversity and Protected Areas: to ensure effective implementation of the Biodiversity Action Plan;
    to prepare a national strategy and action plan for combating spread of invasive species; and
    to protect fish habitats against both encroachment and pollution.

Implementation: EIA and EMP.
Karachi Port Trust SoPs for handling of Coal.

The Standard Operating Procedures (SOP), for minimising pollution during handling of coal have been prepared in consultation with officials of Traffic Department and Port Security Force. The SOPs have been communicated to the Secretary, Stevedores Conference and the specific Stevedores for strict implementation.

<table>
<thead>
<tr>
<th>Standard Operating Procedures</th>
<th>Penalty</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Cargo operation without tarpaulin between ship and berth.</td>
<td>Rs. 10,000/- against each memo minimum</td>
</tr>
<tr>
<td>b) Opening of grab at level higher than top of the heap on the wharf</td>
<td>Rs. 1,000/- each time</td>
</tr>
<tr>
<td>c) Loading of truck above hatch level.</td>
<td>Rs. 1,000/- each truck</td>
</tr>
<tr>
<td>d) Number of persons deployed for cleaning the entire passage of trucks from wharf to coal stacking yard less than 2 persons per 150m.</td>
<td>Rs. 2,000/- against each memo</td>
</tr>
<tr>
<td>e) Incomplete covering of truck hatch.</td>
<td>Rs. 2,000/- each truck</td>
</tr>
<tr>
<td>f) Spillage of cargo by truck on the way.</td>
<td>Rs. 2,000/- against each memo</td>
</tr>
<tr>
<td>g) Number of persons deployed for cleaning the entire passage of trucks from wharf to coal stacking yard less than 2 persons per 150m.</td>
<td>Rs. 1,000/- against each memo</td>
</tr>
</tbody>
</table>

The Traffic Department includes ‘relevant instructions’ as per SOPs in each letter for “allotment of plot” issued to the stevedores for stacking of coal.

Before commencement of cargo operation the Traffic Inspector Wharf ensures that tarpaulins of suitable size are rigged up between ship and berth to avoid spillage in sea.

The attending outdoor clerk (checker) of Traffic Department ensures that:
- The grab from ship’s crane is not opened before reaching the top of the heap on the wharf;
- The truck does not leave the wharf without covering the hatch by tarpaulin; and
- The tarpaulin is lashed at least 3 points on each side of the truck.

The Port Security Force personnel at the gate do not let the truck pass if it is not properly covered or if there is any spillage of cargo from any opening; The PSF Mobile Staff checks the trucks for these violations during the passage from Gate to Coal Stacking Yard. They also keep a check on the speed of the truck which should not exceed 15 km/hr on leveled and clear road.

The relevant staff of the Traffic Department at the wharf and at coal stacking area ensures that the stevedores arrange for time to time spraying of water on coal heaps covering the entire surface area to avoid spreading of dust.

The MPCD Staff maintains frequent surveillance of the area and ensures that the stevedores maintain workforce at a minimum of 2 persons per 150m of the road for prompt cleaning of the area through which the trucks pass. In case of any violation the MPCD staff issues memo for penalty to stevedores. The penalty however is approved by the General Manager (Operations) on case to case basis. Also the Traffic Department Rep or PSF Rep. on the spot counter signs the memo and gets the signature/thumb.
impression of the truck driver or cargo foreman, as the case may be. **normally at following rates**

The above penalties have been kept low to establish the penalty system; these would be enhanced in future if found ineffective.

### 2.2 Legal Instruments

These statutes determine the legal obligations of the project sponsors in the context of environmental protection. During the uplift phase and the operational activities the relevant provisions of the following legal instruments would be observed in letter and spirit:

- The Pakistan Environmental Protection Act, 1997;
- The Pakistan Environmental Protection Agency Review of IEE and EIA regulations, 2000 (IEE-EIA regulations, 2000);
- KPT Act 1886 as amended in 1994; and
- Ports Act 1908.

**Pakistan Environmental Protection Act (PEPA), 1997**

The Pakistan Environmental Protection Act (PEPA) (1997) covers the preservation of the environment, pollution control and biodiversity.

PEPA 1997, along with the National Environmental Quality Standards (NEQS), serves
as the main legislative and regulatory instruments in Pakistan in the context of protection of the environment. They do not specifically address the issue of coal pollution but requirements exist for conducting IEE and EIA depending on the nature of the project.

The Act prohibits discharge and emission of harmful substances in concentrations exceeding the NEQS. The Act also specifies the procedure for the handling of hazardous materials.

Section 14 of the Act reads as follows:

“Subject to the provisions of this Act, no person shall generate, collect, transport, treat, dispose of, store, handle or import any hazardous substances except under a license issued by the Federal Agency or in accordance with the provisions of any other law for the time being in force, or of any international treaty, convention, protocol, code, standard, agreement or any other instrument to which Pakistan is a party.”

Section 31 of the Act (Powers to make rules), reads as follows:


The Act acknowledges terms like “ecosystem”, “bio-diversity” and cites (convention on illegal trade of endangered species). Also any change in land or water use as a result of a project tantamount to a change in the environment.

Implementation: Impact assessment, mitigation, monitoring and environmental management.

**Pakistan National Environmental Quality Standards (NEQS)**

The National Environmental Quality Standards (NEQS) were drafted by the Pakistan Environmental Protection Agency (Pak-EPA) under clause (e) of Sub-section (1) of section (6) of the Pakistan Environmental Protection Act, 1997, and with the approval of the Pakistan Environmental Protection Council. They were implemented in 1993 and relate to municipal and liquid industrial effluents, industrial gaseous emissions and motor exhaust and noise.

Generally for the protection of human health and the environment, emissions standards for vehicles are fixed for different parameters like carbon monoxide (CO), hydrocarbons (HC), nitrogen oxides (NOx), smoke and particulate matter (PM) which are emitted from vehicles and also for secondary pollutants (by-products) such as ozone. Implementation: impact assessment, mitigation, monitoring
Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations 2000 (IEE-EIA regulations, 2000)

Justification for Placement in Schedule-2
Under the Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations 2000 the Storage and handling of coal is not mentioned in Schedule 1 or Schedule 2. Considering the disturbance caused by the coal handling processes it is deemed that the project may be placed in Schedule 2 item J-2 which reads:

‘Any other project likely to cause an adverse environmental effect’

Therefore, an EIA of the Project is required.
Implementation: EIA in entirety.

Karachi Ports Trust Act 1886 as amended in 1994

Section 90: Port to be pollution free etc.

(90.1) The Board shall be responsible for maintaining the environment in the areas under the jurisdiction of KPT on land and within Port limits seaward, free from pollution.

(90.2) No discharge of solid, liquid and gaseous waste; or oily, noxious, radioactive and hazardous industrial effluents in concentrations exceeding NEQS; or oily bilge, sludge, garbage, residues and mixtures containing noxious solid and liquid wastes from ships; or de-ballasting of unwashed cargo tanks, tank washings from oil tankers; or garbage, organic matter; or other pollutants as may be specified by the Board shall be made in the areas under jurisdiction of KPT on land and within Port limits Seaward.

(90.3) Any person contravening the provisions of sub-section (2) shall be liable to penalty not exceeding ten million rupees for each contravention in addition to the charges for cleaning of the Port and removal of pollution there from.
Implementation: Environmental Monitoring and Management Plans.

Ports Act 1908

Under this Act a Polluter is liable to penalty and simple imprisonment for a term which may extend to six months.
Implementation: Monitoring Plan.

2.3 International Conventions

· The London Dumping Convention, 1972;
· United Nations Convention on Law of the Sea (UNCLOS-82); and
· CBD (Convention on Biological Diversity).
London Dumping Convention 1972

The London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter was originally agreed in 1972. The London Convention defines a Black List of toxic substances, the disposal of which, by dumping into the sea, is prohibited and a Grey List of less hazardous substances that may only be dumped under a prior special permit; the dumping of any other wastes not specified in these lists requires a prior general permit.


The UN Convention on the Law of the Sea was adopted and opened for signature in 1982. On 16th November 1994, it entered into force for 68 countries. Pakistan is a signatory to the Convention.

The Convention establishes a comprehensive framework for use of the ocean and its resources. Its 320 articles, supplemented by nine detailed annexes, specify the rights all nations may exercise in the world oceans and their responsibility to do so with due regards for the rights and interests of other nations. The preservation and protection of the marine Environment and the conservation of marine living resources are fundamental obligations.

The Law of the Sea Convention represents the first comprehensive statement of international law on protection and preservation of the marine environment and provides a legal and institutional framework for marine environmental protection and related dispute Settlement.

Implementation: Monitoring plan.

Convention on Biological Diversity (CBD)

The International Convention of Biodiversity was adopted during the Earth Summit of 1992 generally known as the Rio-Conference. The convention requires parties to develop national plans for the conservation and sustainable use of Biodiversity and to integrate these plans into national development programmes and policies. Parties are also required to identify components of Biodiversity that are important for conservation and to develop systems to monitor the use of such components with a view to promote their sustainable use.

Implementation: Impact mitigation and EMP.

Occupational Safety and Health Convention, 1981
OSCH Convention is an International Labour Organization Convention, established in 1981, contain following relevant Articles.

**Article 4:**

1. Each Member shall, in the light of national conditions and practice, and in consultation with the most representative organisations of employers and workers, formulate, implement and periodically review a coherent national policy on occupational safety, occupational health and the working environment.

2. The aim of the policy shall be to prevent accidents and injury to health arising out of, linked with or occurring in the course of work, by minimising, so far as is reasonably practicable, the causes of hazards inherent in the working environment.

**Article 5:**

The policy referred to in Article 4 of this Convention shall take account of the following main spheres of action in so far as they affect occupational safety and health and the working environment:

(a) design, testing, choice, substitution, installation, arrangement, use and maintenance of the material elements of work (workplaces, working environment, tools, machinery and equipment, chemical, physical and biological substances and agents, work processes);

(b) relationships between the material elements of work and the persons who carry out or supervise the work, and adaptation of machinery, equipment, working time, organisation of work and work processes to the physical and mental capacities of the workers;

(c) training, including necessary further training, qualifications and motivations of persons involved, in one capacity or another, in the achievement of adequate levels of safety and health;

(d) communication and co-operation at the levels of the working group and the undertaking and at all other appropriate levels up to and including the national level;

(e) the protection of workers and their representatives from disciplinary measures as a result of actions properly taken by them in conformity with the policy referred to in Article 4 of this Convention.

**Article 6:**

The formulation of the policy referred to in Article 4 of this Convention shall indicate the respective functions and responsibilities in respect of occupational safety and health and the working environment of public authorities, employers, workers and others, taking
account both of the complementary character of such responsibilities and of national conditions and practice.

Article 7:

The situation regarding occupational safety and health and the working environment shall be reviewed at appropriate intervals, either over-all or in respect of particular areas, with a view to identifying major problems, evolving effective methods for dealing with them and priorities of action, and evaluating results.

2.4 WORLD BANK’S EHS GUIDELINES ON COAL PROCESSING

Potential environmental issues associated with coal processing projects include:
- Air emissions
- Wastewater
- Hazardous materials
- Wastes
- Noise
- Air Emissions

Fugitive Particulate Matter and Gaseous Emissions.

The main sources of emissions in coal processing facilities primarily consist of fugitive sources of particulate matter (PM), volatile organic compounds (VOCs), carbon monoxide (CO), and hydrogen. Coal transfer, storage, and preparation activities may contribute significantly to fugitive emissions of coal PM.

Recommendations to prevent and control fugitive coal PM emissions include the following:
- Design of the plant or facility layout to facilitate emissions management and to reduce the number of coal transfer points;
- Use of loading and unloading equipment to minimize the height of coal drop to the stockpile;
- Use of water spray systems and/or polymer coatings to reduce the formation of fugitive dust from coal storage (e.g. on stockpiles) as feasible depending on the coal quality requirements;
- Capture of coal dust emissions from crushing / sizing activities and conveying to a bag house filter or other particulate control equipment;
- Use of centrifugal (cyclone) collectors followed by high efficiency venturi aqueous scrubbers for thermal dryers;
- Use of centrifugal (cyclone) collectors followed by fabric filtration for pneumatic coal cleaning equipment;
· Use of enclosed conveyors combined with extraction and filtration equipment on conveyer transfer points; and
· Suppression of dust during coal processing (e.g., crushing, sizing, and drying) and transfer (e.g., conveyor systems) using, for example, ware spraying systems with water collection and subsequent treatment or re-use of the collected water.

SECTION 3.
PROJECT DESCRIPTION

3.0 PROJECT DESCRIPTION

3.1 Working at Karachi Port.
3.2 Coal stacking yard – Description.
3.3 Coal ‘in’ and ‘out’ procedures.
3.4 Aesthetical considerations.
3.5 Equipment including water spray system, heavy machinery, Segregating equipment, Dumpers, etc.
3.6 Dedicated Terminal
As mentioned in section 1 the project under consideration consists of following components.

E. Introduction of massive reforms seeking pronounced improvement in existing coal handling regime in the context of efficiency, safety and uplift of environment.

F. Feasibility study for construction of a dedicated coal terminal with modernized dust-free loading, unloading and transportation gears

Component ‘A’ envisages short and mid-term measures to:

vi. Ensure strict adherence and compliance to KPT’s Coal Policy during transport, unloading, stacking and reloading.

vii. Obviate coal dust fugitive emissions to almost zero level.

viii. Contain and suppress the coal dust within the coal yard.

ix. Promote consciousness among workers on health & safety, use of PPE, etc.

x. Improve area aesthetics, landscaping and housekeeping.

The measures required to execute component ‘A’ would inter-alia include the following Short Term Measures as directed by the honourable High Court in Constitution Petition No.D-5130/2014 on coal Pollution.

• Tarpaulin cover on dumpers / delivery trucks.
- No dumping on wharf while discharging coal.
- Speed of dumpers to be controlled.
- Road from wharf to Coal Yard be cleaned further.
- Tarpaulin b/w wharf and vessel.
- Loading of trucks up to hatch level.
- Grabs to be opened quite near to dumper at wharf.

Component ‘B’ envisions a dedicated coal terminal capable of:

v. Handling of coal ships including berthing, cargo discharging, cargo movement, etc. through modern mechanized equipment including covered conveyor belts, purpose built loaders, etc. all in an environment friendly manner.

vi. Storage of cargo within prescribed parameters and in a mist laden dust free environment.

vii. Keeping all emissions from the premises within NEQS.

viii. Complying with all provisions of EHS policy.

The measures required to execute component ‘B’ would inter-alia include the following Long Term Measures as directed by the honourable High Court in Constitution Petition No.D-5130/2014 on coal Pollution.

- Dedicated coal berth.
- Conveyor belt from vessel Coal Storage Area.
- Dome to control the pollution.
- Railway facility through Pakistan Railways
- Dedicated railway line from KPT to Pipri.
- Development of Coal Yard with engineering based pollution control facilities.

The above provisions are discussed as part of Project Description in following sub-sections. Their impact identification and mitigation measures are discussed in Sections 5 & 6.

The existing and the planned dedicated terminals would work under the provisions of Environmental Management Plan which inter-alia includes safety and occupational health policies.

Component ‘A’ also includes the following instructions of the Hon’able High Court for immediate action by the KPT and Stevedores.

i. ENVIRONMENTAL IMPACT ASSESSMENT STUDY ON COAL HANDLING

ii. PROVISION OF WIND BREAKERS ON THE BOUNDARY WALL

iii. SPRAYING ON THE COAL HEAPS

iv. REDUCING OF THE COAL STACK AT THE YARD FROM 750,000 M.TONS TO 300,000 M.TONS WITHIN 30 DAYS
Wind breakers on the boundary wall
3.1 WORKING AT KARACHI PORT

3.1.1 Introduction

KARACHI PORT

Karachi Port has a 11.5 km long, 13.5 m deep channel. It has 30 dry cargo berths, 13 berths on West Wharves, 17 berths on East Wharves and 3 liquid cargo berths for POL & Non-POL products. This makes a grand total of 33 berths. The port provides round the clock safe navigation for all vessels including container ships and tankers up to 75,000 DWT.

The port has two container terminals namely, Karachi International Container Terminal (KICT; operated by Hutchison) and Pakistan International Container Terminal (PICT; operated by ICTSI), both have been established by the private sector on BOT basis. Non-container handling operations are carried out by separate private stevedoring companies.

The lay-out and terminal zoning of the existing Karachi port is presented in the figure below.
3.1.2 Cargo Handling

The Department responsible for cargo handling at KPT is the Traffic Department which is part of the Operations Division.

Cargo handling is not physically done by the KPT. This activity has always been outsourced to private ship handling companies. The port issues a stevedoring license to such companies. Tallying of cargo is also under the private sector. KPT undertakes these activities in the legal capacity of a 'Bailee' of the cargo, that is, it handles and holds the cargo in trust for the shipper (exporter) or consignee (importer). With passage of time, cargo handling functions are now performed at container and other terminals by their own labour force. Stevedoring companies do the same at berths where no formal terminals are established.

The back-up area at the container terminals and plinth areas elsewhere are leased/rented out to cargo handling companies. The container terminals perform the complete cycle of services, including physical receipt and delivery of cargo/container. Container awaiting loading on to ships or awaiting delivery after discharge from the ship are kept on the terminal leased land. At other berths the stevedore loads/discharges cargo and cargo may be temporarily stored on the plinth or some designated area by the port.

3.1.3 Coal Handling

Coal is being handled in Karachi Port since early 2003. It has great economic attributes but associated with adverse environmental impact. This includes damage to public health, machinery, infrastructure and pathetic appearance of the area.

The adverse impacts have been mitigated through adoption of stringent measures against mishandling of coal.

However the absence of dedicated coal terminal and dedicated equipment questions the optimum performance of KPT in coal handling. Also additional storage area is urgently needed to handle future volumes; the current storage area interferes with future container handling in PDWCP unless the area is converted into a dedicated coal terminal.
Presently the coal in the port is handled mainly at the deep multi-purpose berths (10-14). Once ships are partly discharged and require less draft, they are moved to other berths (1-3) to make way for other vessels. The average size of the shipment is 53,000 tons which is unloaded by means of grabs and transported to temporary coal yard situated off the Groyne area by ‘dumper trucks’. Double handling therefore takes place when the coal is transported from berth to coal yard and then re-loaded for transport to the hinterland.

The main bottlenecks for the existing handling of coal are:

- No dedicated coal terminal
- Not so efficient handling of coal from ship to shore and from shore to storage
- Limited storage area (300,000 to 400,000 tons)
- Draft restrictions for coal vessels
- Hinterland transport is inefficient: all coal is transported using trucks, causing traffic jams and it prevents the benefits from scale economies

**Major Coal Importers**

- M/s Pak Land Cement
- M/s Patrocoal Synergies
- M/s Engro Eximp
- M/s Jaffer Brothers
- M/s Aqua Logistics
- M/s Agro Trade
- M/s Lucky Cement
- M/s Maple Leaf Cement
- M/s Thatta Cement
- M/s Power Cement
- M/s Cheerat Cement

- M/s Lucky Commodities
- M/s Awan Trading Company
- M/s ICI Pakistan
- M/s Kopak Impex
- M/s Alsa & AAK Commodities
- M/s Mohsin Oil
- M/s Best Way Cement
- M/s D.G Khan Cement
- M/s Mustehkam Cement
- M/s Pioneer Cement
- M/s Fecto Cement
3.2 COAL STACKING YARD - DESCRIPTION

The existing coal yard is located on the back-up area of the PDWCP, east of Keamari Groyne as shown in the image above. With its water front in PDWCP basin the coal yard is bounded by a wall on the entire land side. This boundary wall has a couple of openings including that for the railway track. In fact it is breached at several points thus threatening the area security.
1. Storage area: 180,000 sq. mtrs.
2. Available Storage Capacity: 0.7 million ton
3. Coal handling Capacity: 8 million tons/year
4. Coal handled 2013-14: 4.1 million tons

As this coal yard is adjacent to the under-construction berths of PDWCP the coal dust can have severe adverse impact on the operation of these berths unless massive reforms are undertaken as recommended in this study. Such actions call for will and understanding. As an example simply by reduction of coal stock from 700,000 to 500,000 the area which looked like this on 1st Dec14:

Looked like this on 23rd Dec14.
3.3 COAL ‘IN’ AND ‘OUT’ PROCEDURES

3.3.1 Coal handling capacity

Existing coal handling capacity in Karachi port is 7.2 million tons. This is sufficient to accommodate existing coal volumes in Karachi port.

3.3.2 Coal movement logistics

1. Vessel arrives at port with 55000 tons of coal
2. Berthed and unloaded in 4 days through ship’s cranes using grabs
3. Cargo moved to coal yard 1.2 km away through dumper trucks.
4. Coal retained in coal yard for varying durations by different consignees as per requirement at user end.
5. Transportation to Central Punjab @ 15000 tons/day (300 Trucks x 50 tons)
6. Cargo reaches Central Punjab in 3-4 days by trucks at PKR 4,000/ton.
### Year-wise Quantum

<table>
<thead>
<tr>
<th>YEARS</th>
<th>NOS. OF SHIPS</th>
<th>CARGO (MILLION TONS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008 – 09</td>
<td>85</td>
<td>3.4</td>
</tr>
<tr>
<td>2009 – 10</td>
<td>93</td>
<td>3.7</td>
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<tr>
<td>2010 – 11</td>
<td>98</td>
<td>3.9</td>
</tr>
<tr>
<td>2011 – 12</td>
<td>76</td>
<td>3.1</td>
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<tr>
<td>2012 – 13</td>
<td>71</td>
<td>3.6</td>
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<tr>
<td>2013 – 14</td>
<td>75</td>
<td>4.1</td>
</tr>
<tr>
<td>2014 – 15 (UPTO OCT)</td>
<td>28</td>
<td>1.6</td>
</tr>
</tbody>
</table>

### 3.4 Aesthetical considerations

As apparent from following photographs of different locations in the yard, the aesthetics all over the yard is far below satisfactory.

The above nuisance is attributed mainly to:

i. The indiscriminate use of water in the entire coal yard purported mainly to suppress the dust on the pathways between the coal heaps. The stranded water, besides dirtying the area within the yard, gets carried away with wheels to far distances on the roads. The slurry after drying up on the roads results in spreading of dust in the atmosphere.
ii. The water which is meant to be sprayed on the top of the heap for suppressing the dust is instead forced in the lower part of the heap for increasing the moisture content of the coal.

iii. Paucity of house keeping efforts as all concerned tend to shed responsibility their shoulders in regard. This is more apparent from following photographs of the containerised office area which are required to be maintained by the Stevedores but they appear to have become lethargic with the coal laden surroundings.
3.5 EQUIPMENT INCLUDING WATER SPRAY SYSTEM, HEAVY MACHINERY, SEGREGATING EQUIPMENT, DUMPERS, ETC

3.5.1 Water spray systems.

REDUCING AIRBORNE DUST AT UNLOADING

Other coal dust control technologies mitigate dust the same way firefighters put out a fire. They use a powerful water spray to smother clouds of dust erupting from a pile of coal as it is unloaded from the ship.

It is a universal practice to spray water on coal to suppress dust.

As per SoPs in KPT it is required that water is sprayed on coals at different handling points and on the heaps in the coal yard.

The spray is done through an standard nozzle and hose periodically to maintain wetness during cargo discharge at berths and loading on trucks.
In 2009 a high pole mounted sprinkler was installed in the yard as a test for installation of 8 similar sprinklers covering the entire yard. Ground water was made available to the electrically driven pump for spraying at a height of about 15 mtrs. Apparently the project did not survive due to lack of will to overcome the teething issues.

This tanker, carrying sea water is deployed for keeping the pathways wet. The stranded water, and the coal muck, besides dirtying the area within the yard, gets carried away with wheels to far distances on the roads. The slurry after drying up on the roads results in spreading of dust in the atmosphere.

3.5.2 Heavy machinery

The heavy machinery deployed for streamlining the coal heaps is required to be maintained as their engines emit substantial smoke adding up to the coal dust blackness in the atmosphere and creating health issues for the workers. They also work on top of the heaps creating safety issues. In addition the noise issues are also a point of concern.
3.5.3 Segregating equipment

**Vibrating Screen**
The Vibrating Screen are used to separate materials into various sizes for further processing. The vibrating screens are mainly used in coal dressing, metallurgy, mine, power station, water conservancy project, building industry, light industry, etc.

In KPT coal yard these segregation arrangements have caused immense nuisance in the context of dust emissions, particularly because of negligent handling of the equipment. This is discussed in detail in Section 5 & 6.
3.5.4. **Dumpers, trucks, etc**

Dumpers are used for transportation from ship to coal yard.

Trucks of different sizes including 16 wheelers carry the coal from coal yard to final destination. Besides their own emissions their negligent/heedless handling can cause severe pollution on land and atmosphere. Their impact and mitigation measures are discussed in sections 5 & 6 respectively.
3.6 Dedicated Terminal

KPT has been well aware of the need of a dedicated mechanized coal terminal ever since the coal import has taken new dimensions. Initially the coal terminal was included in KPT’s mega project of Cargo Village. As the Cargo Village project has been delayed due to certain constraints KPT has considered certain other locations including the existing coal yard for setting up a modern dedicated coal terminal. KPT has already invited Consultancy Offers from reputable firms for the purpose.

The advertisement inviting proposals appeared in the leading Dailies much before the petition mentioned in Section 3.0 above was filed in the high court.

- As planned, a new dedicated coal terminal will be constructed, likely at 2 berths in PDWCP, with a starting capacity of 12.8 million tons, and further increases to over 20 million tons in year 2025 after deepening of PDWCP to 18m draft levels. Hence, Karachi port will offer sufficient capacity to handle the forecasted coal volumes assuming the new dedicated coal terminal will be developed in the short term future.

- In case the dedicated coal terminal will not be developed within PDWCP, berth 14 - 17 may be redeveloped as a specialized and dedicated coal facility (also capacity of 12.7 million ton), with a high level conveyor belt to the bonded coal stack area at timber pond and road/rail connection to main railway network and city roads.

- Following news item sheds light on future coal handling plans of the Ministry and KPT.

**Daily Dawn 6th March 2014**

KARACHI: Minister for Ports and Shipping Kamran Michael said on Wednesday that work is going on at fast track to increase coal handling capacity of all the ports to meet the expected surge in its demand from upcoming power plants across the country.

Talking to Dawn at Port House, the minister said that in order to develop supply chain starting from ports up to the entry gates of power plants, all the relevant departments and ministries have been taken in the loop including Pakistan Railways, Communication and engineering departments to ensure uninterrupted supply of coal.

The Karachi Port, he said, has been asked to increase its coal handling capacity which is presently catering to a small demand of coal arising from cement plants.
However, when power plants run on coal come into generation a mammoth quantity of coal would be needed which will be mostly met from imports.

Mr. Michael said that on an average each power plant needs around 17,000 tonnes of coal per day, which means that a vessel with a capacity of 55,000 to 60,000 tonnes would be required to meet the daily demand of only three power plants.

Similarly, he said that in order to have cheap cost of haulage of coal the capacity of railways will also have to be developed.

He said the ministry has initially asked the KPT to dedicate five berths (10 to 14) which are having deeper draft of up to 13 meters for handling ships loaded with coal. He said a conveyer belt of 200 meters is being built to ensure rapid unloading and loading of coal.

Presently, the coal is being handled manually and loaded on dumper trucks.

Pakistan Railways is being asked to lay down tracks where necessary so that coal movement up to the gates of these power plants was made possible, he added.

The minister said he chaired on Wednesday a meeting of the heads of KPT, Port Qasim, Director General Ports and Shipping and secretary Ministry of Ports, and a roadmap was chalked out to develop a supply chain for coal starting from ports up to power plants.

Though a bulk cargo terminal is already being built by a private company at Port Qasim to handle dirty cargo like coal, clinker and cement, the government, looking at future demand for coal, has planned to have another such terminal at PQA.

Similarly, he said another coal handling facility will be developed at Pakistan Deep Water Container Port (PDWCP) where six berths could be developed with deeper draught of 18 metres.

Coal received at general cargo berths and its transportation to coal yard and from coal yard to other parts of the country creates pollution problems all along its way including the nearby localities due to prevailing winds and vehicle movements. This has created public resentment.

KPT has planned the development of a fully mechanized coal terminal with covered conveyor belts, purpose built loaders and mist laden storage to prevent pollution by coal dust emissions.

The development of a new coal import terminal at PDWCP would offer huge potential for KPT in the further development of the new deep water port, as well as to increase its return on investment. The exact location still needs to be
determined, and should take into account its (potentially negative) impact on container operations at Hutchison’s SAPT terminal. Furthermore, the impact on the environment and the residential area in vicinity of DWCP shall be taken into account. Large coal carriers are usually Cape Size which will need extensive dredging of a 20 meter deep channel and 23 m deep approach. To facilitate the transport of coal volumes from Karachi port to the power plants located in the Punjab region, significant investments in road and railway connections are required.

3.6.1. Handling Capacities

The future requirements for the handling of coal from the port would require the investments mentioned above. With the projected 17 million tons of coal handling at KPT in 2025, an average of almost 47,000 tons per day would need to be transported from the port to the hinterland. With one train taking an average of 2,000 tons of coal, almost 24 daily coal trains would leave from KPT only. Besides the requirements in rolling stock which have been announced by Pakistan Railways, this would certainly require investments by KPT as well. This number of trains requires a dedicated coal terminal and loading facility in the port.

As planned, if in future the coal is handled at two berths in PDWCP (750 meter quay length), the minimum coal handling capacity is estimated at 12.7 million tons per annum. As PDWCP is being dredged to 16m in the first phase and 18m in the second phase, the coal terminal capacity will also increase accordingly, to 19.7 million tons per annum.

3.6.2. PROPOSED SITES FOR THE TERMINAL

KPT has considered 3 sites for the proposed dedicated coal terminal. The No. 1 choice was the proposed Cargo Village which has not materialized. The remaining two sites are
i. the existing coal yard as part of PDWCP and
ii. Berths 14-17 linked to storage area at Timber Pond area through covered conveyor belt.

As mentioned above KPT has already invited Consultancy Offers from reputable firms for the purpose. The bidding Consultants have also been asked to propose the site for the terminal.

3.6.3. PROPOSED TERMINAL

The Design, Layout, Infra-structure and Installations for the Terminal as proposed by the successful bidder and finalized by KPT would necessarily comply with the EHS Policy in entirety. The EHS Policy would categorically be enhanced for the construction and operation of this terminal and the guidelines spelled out in Section 6 would be strictly adhered to.
Irrespective of the selected site and the design of the terminal proposed by the Appointed Consulting firm it is to be ensured that there is zero spill and dust emission during the entire unloading, transportation and storage of coal and coal dust from cradle to grave. Suitable hoppers/ chutes are to be used for unloading. Covered conveyor belts are to be used where possible and other means of transportation would also ensure zero spillage and dust emission. Water spray system and mist producer such as the one shown below are to be suitably located throughout the operation.

The DustBoss DB-60 is an oscillating, 25 horse-power fan that can cover 21,000 square feet with a blanket of fine mist - atomized water droplets designed specifically for capturing and containing coal dust. The DB-60 is developed by Illinois-based Dust Control Technology. "We atomize the water to 50-200 microns, which gives us the maximum attraction and avoids a slipstream effect," said DCT President Edwin Petersen. The DB-60 features 30 brass nozzles designed specifically to atomize droplets to the optimum size for dust capture.

Spray to be done on wagons or trucks in the following manner, with a good control on amount of water sprayed.

Segregation of coal/coal dust within the coal yard is not recommended but if it becomes imminent on commercial grounds then a completely covered location may in the yard.
may be allocated for the purpose and it should be ensured that segregation operations comply with the guidelines. Vibrating screen, if used, should be of the type such as the one shown below.

SECTION 4

BASELINE ENVIRONMENT
4.1 Topography & Area Geography
4.2 Weather Conditions
4.3 Seismology
4.4 Sedimentation
4.5 Water Quality
4.6 Sediment Quality
4.7 Air Quality
4.8 Noise
4.9 Marine Ecosystems
4.10 Fisheries
4.11 Landscape
4.12 Seascape
4.13 Socio-Economic Condition
4.14 Services
4.15 Recreation and Tourism
4.16 Traffic and Transport
4.17 Health
4.18 Safety
4.1 Topography & Area Geography

4.1.1 Topography

The upper image depicts the location of existing coal yard with reference to Oil piers and Pakistan Deep Water Container Port. The topography of the coal yard is quite apparent in the lower image. The area is of irregular shape and apparently coal has also been stacked in different vacant spaces available around the original plot which was earmarked for coal storage. The coal spread has made the topography somewhat indistinct. The ground surface is grossly uneven. For reference the users have divided the area into four sections out of
which one is an elevated section. This section is raised because of the stockpile of
dredged spoil from PDWCP basin.
The seaward boundary of the site is a stoned seawall. The oil installations side has a
brick wall breached at several points other than the gated entrances for trucks and
railway wagons. The Eastern boundary joins the proposed backup area of the PDWCP.

4.1.2 Geographical Description

The coal yard is situated on the East of Keamari Groyne and south of Keamari oil
installations area. Two-third of the Southern boundary forms the seafront and remaining
joins the plinth area of the newly constructed PDWCP berths. The proposed backup area
of the PDWCP lies on the East of the Yard.

4.1.3 Geological Description.

Historically the coastal region is found to be of tertiary and post-tertiary origin. The region
has been formed by the upheaval of land from the Tethys Sea, which once extended up
to the northern border of Pakistan but, gradually withdrew with the rising of the
Himalayas. The particular soil formation in and around the project area revealed the
presence of sand bar deposits comprising of fine to coarse, micaceous sand.
4.2 Weather Conditions

4.2.1 Climate

The coastal meteorology and hydrography of Karachi is controlled by the seasonal change in the North Arabian Sea i.e. monsoonal system. The data collected from various studies along the coast clearly show the influence of NE and SW monsoon winds. A general summary of meteorological data is presented in the following section in order to understand the consequential impacts of coal associated with wind and rain as investigated in this study.

The entire coastal area of Sindh is included in the warm monsoon climatic region. The climate is characterized by pleasant weather due to a sea breeze which blows all year round except for local disturbances during winter and summer months. Mild winter extends from November to February and a few cold spells occur occasionally due to western weather disturbances. Similarly, summer extends from March to June and hot weather sets in when hot winds start blowing from Rajasthan, India. When the pressure vacuum builds up in the north Arabian Sea or over Sindh-Kathiawar coast it stops the sea breeze over the Indus delta. Thereafter the temperature increases up to as high as 48°C, making the hot weather along the coast very uncomfortable. Seasonal fluctuations in temperature and monsoon rains characteristically indicate the climate of dry tropical and sub-tropical climate zone in this tract. Atmospheric aridity is the chief characteristic feature of this area.

Temperature and humidity:

The mean maximum air temperature variation ranges from around 25 - 33°C throughout the year. In July and August due to cloud cover the temperature is slightly lower than in May and June but the atmosphere is laden with humidity (85%). The temperature variation is composed of periodic and non-periodic components. Periodic changes are generated by the incoming solar radiation, while non-periodic ones are mainly due to changes in cloud conditions, vertical motion and mixing in the atmospheric boundary layer.

Humidity is a marked feature of the coastal region. It is generally higher in the morning in comparison with the afternoon. It also varies from place to place depending on its proximity to the sea. The average annual humidity for Karachi is 80%, ranging from an average of 60% in January/December to an average of 85% in August.

The climate conditions for Karachi are summarised in Table below.
4.2.2 Karachi weather averages

| Months          | J | F | M | A | M | J | A | S | O | N | D |
|-----------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Average min temp (°C) | 13| 14| 19| 23| 26| 27| 26| 25| 22| 18| 14|   |
| Average max temp (°C) | 25| 26| 29| 32| 33| 33| 31| 32| 30| 26|   |   |
| Average temp (°C)     | 19| 20| 24| 28| 30| 30| 29| 28| 27| 24| 20|   |
| Average rainfall (mm) | 07| 11| 02| 02| 07| 96| 50| 15| 02| 06| 05|   |
| Wet days (>0.1mm)     | 01| 01| 01| 00| 01| 02| 01| 00| 00| 00| 01|   |
| Relative humidity (%) | 61| 70| 77| 79| 83| 83| 85| 84| 79| 67| 60|   |
| Av. wind speed (Beaufort) | 2| 2| 3| 3| 3| 4| 4| 3| 3| 2| 2| 2 |
| Average no. of frosty days | -------------- | Nil | | | | |

4.2.3 Precipitation

Karachi is situated in a semi-arid climate zone and, therefore, the annual rainfall is quite low. The average of two decades (1970s and 1980s) shows that it varies between 150 - 250mm during the year. For Karachi the average number of rainy days / year is two or less. However, most of the precipitation usually takes place within a short spell of 2 - 7 days. It is estimated that about 70% of the annual rainfall occurs in July and August, during the southwest monsoon season. The winter months (December to February) are less wet, but do have about 11% of the annual rainfall. The rest of the rain occurs in the form of mild showers or drizzles rarely exceeding 15mm at a time.

Cyclones breed in the Arabian Sea and usually hit the coast near Bombay and Gujarat in India. They then pass overland towards the north-west and before hitting the coast of Pakistan veer off west towards the Arabian Sea where they dissipate. Karachi does, however, suffer from the effects of the passing cyclones such as strong winds, rough seas, swell and heavy rain but is saved from the destructive effects of the cyclones.

4.2.4 Wind Speed & Direction

The wind is another important feature of the coastal region. It is variable, being faster in summer than in winter with the highest velocity observed during the monsoon period. The velocity increases from morning onwards to the evening. Northerly to North-Easterly winds prevail during the morning, changing to Westerly and South-Westerly directions for the rest of the day. The wind usually blows from 7.4 to 20.5km/h during summer but with the creation of the tropical depressions in the Arabian Sea the wind gets transformed into cyclonic storms attracting rains, with the result that high tidal waves sweep over large areas. This phenomenon occurs from June to September which indicates that cyclones
are very much expected during the monsoon season. The worst storm ever recorded at Karachi was in June 1936 having a speed of 130km/h (DHA, circa 2007). The observation made in the National Institute of Oceanography study determines that, wind intensity during the month of January is relatively weak with a velocity of 2.5m/s, with a direction 45° from north and from February to May the wind direction swings between 270° and 45° while in April and May the wind speed shows an increase up to 3.5m/s (DHA, circa 2007).

During the month of June the wind speed increases and ranges from 4 - 9m/s with a direction of 225° - 350°. Maximum velocities are recorded during the month of July i.e. from 9 - 12m/s with a prevailing direction of 225° - 315°. The month of July is usually considered as being the peak of the southwest monsoon. During the month of August wind speed ranges between 2 - 9m/s with a direction of 300° to 45° where as during the month of October and November, wind blows with varying speed, between 3 and 9m/s and direction shifts between 45° and 320°. During the month of December the prevailing wind speed is predominately 2m/s from a variety of directions varying between 225° and 135° (DHA, circa 2007).

4.3 Seismology

Tectonically, 75% of Pakistan lies on fault lines. The Pakistan coast is vulnerable mainly to two Tsunamigenic sources namely, the Makran Subduction Zone (TSU1) and the Murray Ridge (TSU2). The Makran Subduction Zone is an Active Plate Boundary. As such, it is a known site with potential for large (7) and infrequent great (7.8) earthquakes caused due to subduction of the Arabian Plate beneath the Eurasian Plate. The great earthquake of 28th November 1945 occurred offshore of the Makran coast south of Pasni with its epicentre at 63°E and 24.5°N. The magnitude of the event was 8.3. A widespread tsunami was generated which hit the coastal areas two hours after the first shock. The height of the tsunami was about 5m at Ormara. The Murray Ridge played a positive role during the great earthquake by obstructing the approaching tsunami waves to the coast of Karachi. The occurrence of a future Tsunami event from this source region cannot be ruled out.

4.3.1 Building Code of Pakistan

According to one classification Pakistan has 15 seismo-tectonic regions. The proposed project is located in the seismo-tectonic region where a moderate level of seismic activity is believed to exist, but large magnitude earthquakes are rare. The Building Code of Pakistan places Karachi in Zone 2 corresponding approximately to Intensity VII of the Modified Mercalli Scale of 1931. Thus a building that is designed, for example, on the basis of Uniform Building Code Zone 2B, which corresponds to peak ground acceleration value of 0.2g, should be able to withstand the seismic load expected in the region.
4.3.2 **Project Area Seismology**

The coastal areas of Karachi also cover the Indus Deltaic region and the seismic activity in the Indus Deltaic region is mainly due to active faults. The northern flank of Indus Delta is delineated by an E-W-fault. This tectonic lineament shows signatures of reactivation during the Pleistocene period and is also well evidenced by frequent seismicity.

The earthquake hazard in the Indus Delta and the estuaries on the passive continental margin is mainly from intra-plate active faults, particularly the Rann of Katch Fault and Pab Fault and their strands. The most spectacular effect of the active fault of Rann of Kutch which grazes the vicinity of Karachi was due to the severe earthquake of June, 1981. It resulted in the 6m uplift of a 16km wide and 81km long tract of alluvial land which blocked the eastern band of the Indus River (the locals called it Allah Band) (Oldham, 1926). Using aerial photographs scientists identified a complex series of faults in the region of Sindh Coast between Karachi and Rann of Kutch (see Figure 4.6). The main faults thus identified are generally oriented easterly, and slightly concave to the north. They roughly parallel the inferred zone of rupture for the 1819 event (Quittmeyer et al, 1979).

4.3.3 **Location of Active Faults Affecting Sindh Coast**

A list of earthquakes with inland epicentres, since 1977 to date which affected the Indus Deltaic Creeks is given in following Table. Under the influence of these earthquakes creeks depths and orientation changes, new islands emerge and sometimes existing alleviated areas are eroded.

**List of Earthquakes in Indus Deltaic Region**

<table>
<thead>
<tr>
<th>Date</th>
<th>Latitude(°N)</th>
<th>Longitude(°E)</th>
<th>Depth (km)</th>
<th>Magnitude(Richter Scale)</th>
</tr>
</thead>
<tbody>
<tr>
<td>26/09/1977</td>
<td>25.4</td>
<td>68.2</td>
<td>33</td>
<td>4.5</td>
</tr>
<tr>
<td>25/11/1982</td>
<td>25.6</td>
<td>67.9</td>
<td>33</td>
<td>4.9</td>
</tr>
<tr>
<td>17/12/1985</td>
<td>24.9</td>
<td>67.4</td>
<td>33</td>
<td>4.9</td>
</tr>
<tr>
<td>24/12/1985</td>
<td>24.8</td>
<td>67.6</td>
<td>33</td>
<td>4.7</td>
</tr>
<tr>
<td>10/09/1991</td>
<td>24.4</td>
<td>68.7</td>
<td>33</td>
<td>4.8</td>
</tr>
<tr>
<td>19/09/1991</td>
<td>24.3</td>
<td>68.7</td>
<td>33</td>
<td>4.7</td>
</tr>
<tr>
<td>23/04/1992</td>
<td>24.3</td>
<td>68.8</td>
<td>33</td>
<td>3.7</td>
</tr>
<tr>
<td>24/12/1992</td>
<td>25.2</td>
<td>67.7</td>
<td>33</td>
<td>3.6</td>
</tr>
<tr>
<td>05/02/1993</td>
<td>24.6</td>
<td>68.9</td>
<td>33</td>
<td>4.3</td>
</tr>
<tr>
<td>26/01/2001</td>
<td>23.4</td>
<td>70.32</td>
<td>17</td>
<td>7.6</td>
</tr>
</tbody>
</table>
4.4 Sedimentation

As the coal yard is situated adjacent to sea it is certain that coal dust including thicker coal particles finds way into the sea and settles on the sea bed. Whereas the impact of coal on the seabed fauna and the sediments chemistry are discussed in sub-section 4.6 it is worth to consider the sedimentation processes in the area. The coal on the seabed would get covered by the littoral drift.

4.4.1 Processes

The three main mechanisms of sedimentation in Karachi Port have been identified and treated separately, and are summarised as:

- Sand, re-suspended by wave action at sea, especially during the monsoon season is transported by the prevailing currents. The Approach Channel traps some of this sand as it moves across the channel.
- Fine sediment on the sea bed is suspended by waves and transported by tidal currents into the Approach Channel and Harbour.
- Fine, muddy material previously transported into the Western Backwaters by tidal currents is re-suspended by local wave action and carried by ebb tidal currents into the Harbour and the approach channel where it may remain until dredged.

*(H R Wallingford 2010)*

**Wave Generated Movement**

Reference is made to Tables 4.8 and 4.9. To calculate the effect of such waves on the movement of sediment, a statistical method of analysis was used to find the probability of occurrence of any combination of wave height, wave period, tidal level and tidal current speed and for each such combination it was then determined whether the sediment would be mobilised. Both the “large” and “small” tidal ranges of this section of the coast were considered together with a third option, namely assuming there were no tidal effects.

It was observed that the percentage of time for seabed material mobility at 20m wave depth is more in the month of July as compared to September but at 10m wave depth it is almost same, or slightly higher, in the month of September than July. Again at 7m wave depth it is higher in the month of July as compared to September. Maximum mobility however takes place at 7m wave depth in the month of July at all tidal ranges.

**Littoral Drift**

Presently, the basin adjacent to project area mainly receives sand ranging in particle size from coarse to fine grain size and some quantity of silt through littoral drift. The dominant direction of sediment movement is known to be from Sandspit area towards the existing Karachi harbour during the flood tide and from Karachi Harbour.
mouth towards Clifton beach during the ebb tide prior construction of break water wall for PDWCP.

**Sewage Derived Sedimentation**

There is an ingress of around 250mg/day (millions of gallons per day) of the city’s municipal refuse directly into Karachi Harbour which is mostly untreated. The solid part of the sewage mixes with the mobile sands and settles to the seabed.

### 4.5 Water Quality

Samples were drawn from locations W1, W2, W3 and W4 at 12:30hrs on 18th June 2010. Low tide; 08:38hrs, high tide; 15:12hrs. Analysis results from these areas are shown in Table below. High COD results which may be attributed to the fact that at the time of sampling, the city waste water had drained into this area via Karachi harbour during ebb tide.

**Water Chemical Analysis Results (18.06.2010)**

<table>
<thead>
<tr>
<th>Sample</th>
<th>pH</th>
<th>DO(mg/l)</th>
<th>COD</th>
<th>Salinity(ppt)</th>
<th>Silicate(mg/l)</th>
<th>Temp.(° C)</th>
<th>Nitrate(mg/l)</th>
<th>Phosphate(mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-1</td>
<td>7.8</td>
<td>4.45</td>
<td>1000</td>
<td>30</td>
<td>0.5</td>
<td>33.3</td>
<td>0.463</td>
<td>0.84</td>
</tr>
<tr>
<td>S-2</td>
<td>7.7</td>
<td>3.86</td>
<td>1000</td>
<td>30</td>
<td>0.4</td>
<td>33.2</td>
<td>0.557</td>
<td>0.78</td>
</tr>
<tr>
<td>S-3</td>
<td>7.8</td>
<td>4.21</td>
<td>1667</td>
<td>30</td>
<td>0.4</td>
<td>32.8</td>
<td>0.554</td>
<td>1.12</td>
</tr>
<tr>
<td>S-4</td>
<td>7.8</td>
<td>4.08</td>
<td>1000</td>
<td>30</td>
<td>0.4</td>
<td>33.4</td>
<td>0.478</td>
<td>0.93</td>
</tr>
</tbody>
</table>

The above sampling sites were all from within the basin adjacent to coal yard. However as the coal is not expected to have any adverse impact on water quality and considering the continuous water exchange it was not considered necessary to carry out fresh sampling of water from this area for baseline determination.

### 4.6 Sediment Quality

#### 4.6.1 Project Specific Sediment Sampling in 2010

To obtain a project specific assessment of the sediment quality samples were taken from the locations within the water basin adjacent to coal yard and were tested at the laboratory at the Institute of environmental studies on 16th June 2010. Sample analysis results are presented in Table below.

**Sediment Sampling Results**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Sample type</th>
<th>Sulphate</th>
<th>Arsenic</th>
<th>TKN</th>
<th>Organic matter</th>
<th>Mn</th>
<th>Phosp</th>
<th>Moisture</th>
<th>Silicate</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>Soil</td>
<td>276</td>
<td>&lt;0.005</td>
<td>114.8</td>
<td>5.34</td>
<td>0.43</td>
<td>1.76</td>
<td>29.4</td>
<td>0.51</td>
</tr>
<tr>
<td>S2</td>
<td>Soil</td>
<td>331</td>
<td>0.01</td>
<td>77.28</td>
<td>5.46</td>
<td>1.16</td>
<td>1.12</td>
<td>20.8</td>
<td>0.43</td>
</tr>
<tr>
<td>S3</td>
<td>Soil</td>
<td>183</td>
<td>&lt;0.005</td>
<td>96.32</td>
<td>5.82</td>
<td>0.61</td>
<td>2.2</td>
<td>25.9</td>
<td>&lt;0.3</td>
</tr>
<tr>
<td>S4</td>
<td>Soil</td>
<td>164</td>
<td>&lt;0.003</td>
<td>107.32</td>
<td>5.38</td>
<td>1.24</td>
<td>1.8</td>
<td>28.9</td>
<td>&lt;0.3</td>
</tr>
</tbody>
</table>
4.6.2 **Fresh Sampling**

To determine the impact of coal, if any, on benthos and sediments’ chemistry fresh samples of sediments were drawn on 9th Dec14 and sent to the Institute of Environmental Sciences, Karachi University for analysis. The Chemical tests were conducted by Dr. Moazzam Khan and Biological tests by Dr. Javed Mustaqueem.

4.6.3 **Chemical Analysis**

The chemical analysis report as received from Dr. Moazzam is as follows. It can be seen that the Sulphates and Phosphates are slightly higher than the Analysis conducted in 2010. As Standards for sediments have not been mentioned in NEQS of Pakistan, it is not appropriate to comment on the significance of these concentrations. Also it cannot be ascertained that this increase is because of coal wash as the number of rainy days per year during the past several years have not been too many. Notwithstanding the above it is being recommended that proper drainage should be arranged for the entire coal yard.

![Image of chemical analysis report]

**Results of Chemical Analysis:**

<table>
<thead>
<tr>
<th>S. No</th>
<th>Sample Code</th>
<th>Sample Type</th>
<th>Sulphate (mg/kg)</th>
<th>Arsenic (mg/kg)</th>
<th>TKN (mg/kg)</th>
<th>Organic Matter (%)</th>
<th>Mn (mg/kg)</th>
<th>Phosphate (mg/kg)</th>
<th>Moisture (%)</th>
<th>Silicate (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Spade Sample</td>
<td>Soil</td>
<td>398</td>
<td>0.009</td>
<td>98.6</td>
<td>5.89</td>
<td>0.87</td>
<td>2.36</td>
<td>30.8</td>
<td>0.66</td>
</tr>
<tr>
<td>2</td>
<td>Core Sample</td>
<td>Soil</td>
<td>316</td>
<td>0.01</td>
<td>87.41</td>
<td>5.12</td>
<td>0.96</td>
<td>2.25</td>
<td>26.9</td>
<td>0.73</td>
</tr>
<tr>
<td>3</td>
<td>S-3</td>
<td>Soil</td>
<td>259</td>
<td>0.008</td>
<td>92.11</td>
<td>5.67</td>
<td>0.71</td>
<td>2.44</td>
<td>29.3</td>
<td>0.51</td>
</tr>
</tbody>
</table>
4.6.4 Biological Analysis

The excerpts from the biological analysis report as received from Dr. Javed Mustaquem are as follows.

REPORT ON THE OCCURRENCE AND ABUNDANCE OF MACROBENTHOS (INFAUNA) IN THE SEDIMENT SAMPLES COLLECTED FROM KEAMARI COAST

Date of sample collection: 9th December 2014
Locality: Keamari, intertidal area
Number of samples: Two—one collected by a corer (Sample No. 1), another one collected by a spade (Sample No. 2)
Type of sample: Sediment (sand) from the intertidal area – low water mark
Sample collected by: Mr. Rashid Usmani
Sample analyzed by: Dr. Javed Mustaquem of Karachi University

INTRODUCTION

Two sediment samples were received, on the day of collection, for extracting and identifying the macrobenthos (or macrobenthic organisms) that live in the sediment (that is infauna). The macrofauna was extracted from the sediment on the same day, as described hereafter in the “Materials and Methods” section.

Benthos is the community of organisms that live either on the surface of the sediment (epifauna) or burrowing in the sediment (infauna). They are classified into three groups on the basis of size: macrobenthos, meiobenthos, and microbenthos. Macrobenthos are greater than 1 mm in size. These organisms are visible with the unaided eye and include such animals as segmented worms, bivalves, gastropods, echinoderms, and crustacean like crabs etc. Meiobenthos comprises of those organisms that pass through 1 mm sieve but retained on 0.1 mm (or more precisely 0.062 mm) sieve. These organisms include foraminiferans, nematodes, gastotrichs, copepods etc. They are hardly visible with naked eye. Microbenthos comprises of those organism that pass through 0.1 mm sieve and includes protozoans, bacteria etc. They can only be seen under microscope. Another group of benthos is recognized by some authors, namely ‘megafauna’ (Smith and Hamilton, 1983). Megafauna are defined as organism that can be retained on a 30 mm sieve. They have low densities are too mobile and hence the usual benthic sampling gears do not sample them adequately. This
‘megafauna’ should not be confused with that of terrestrial ecosystem where it is defined as organisms weighing more than 45 kg.

The use of macrobenthos to ascertain the overall health status of coastal ecosystem is the most suitable, reliable, and widely acclaimed method (Olomukoro and Dirisu, 2014). Macrobenthos are ecologically important and dominant group of benthic communities. They meet several criteria that render them highly recommendable for inclusion in marine monitoring programmes. They are numerically dominant, have relatively low dispersion and mobility capabilities, and live in direct contact with sediment.

The purpose of this report is to document species diversity and abundance of macrobenthos in the soft-bottom sediment of proposed site for coal stacking yard in the vicinity of Keamari groyne.

RESULTS

Sample 1:
Only six specimens of polychaete worm, belonging to family Spionidae, were found. They varied from 8 to 14 mm in length (excluding palps) and about 0.6 to 0.8 mm in body width (excluding parapodia and gills).

Sample 2:
This sample yielded a total of 11 specimens; one mole crab (Emerita holthuisi), one snail (Oliva sp), and nine polychaete worms (spionid worms). The size of the mole crab was 20 mm in carapace length. This mole crab was egg-bearing female. Oliva sp. was 18 mm in length. Spionid worms ranged from 8 to 12 mm in length (excluding palps) and 0.6 to 0.8 mm in body width (excluding parapodia and gills).

Table: Organism found in the two sediment samples

<table>
<thead>
<tr>
<th>Phylum</th>
<th>Class</th>
<th>Family</th>
<th>Scientific name</th>
<th>Common name</th>
<th>Sample 1</th>
<th>Sample 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annelida</td>
<td>Polychaeta</td>
<td>Spionida</td>
<td>Scolelepis sp</td>
<td>Spionid worm</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Arthropoda</td>
<td>Crustacea</td>
<td>Hippidae</td>
<td>Emerita holthuisi</td>
<td>Mole/ sand crab</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Mollusca</td>
<td>Gastropoda</td>
<td>Olivida</td>
<td>Oliva sp.</td>
<td>Sea snail</td>
<td>-</td>
<td>1</td>
</tr>
</tbody>
</table>
CONCLUSION

The results of the present investigation show that the area is very poor in species richness and abundance, which may be attributed to pollution. It is, however, suggested that a more representative sample covering a larger area should be studied.

4.6.5 Supplementary Sampling
In compliance with suggestion given by Dr. Javed Mustaqueem that a more representative sample covering a larger area should be studied, fresh samples were drawn 30th Dec14. A total of 9 samples were sent for analysis.

The final report of Dr. J. Mustaqueem, after analysis of supplementary samples is as under.

REPORT ON THE OCCURRENCE AND ABUNDANCE OF MACROBENTHOS (INFAUNA) IN THE SEDIMENT SAMPLES COLLECTED FROM KEAMARI COAST

Date of sample collection: 9th and 27th December 2014
Locality: Keamari, intertidal area
Number of samples: Eleven (2 samples collected on 9th and 9 samples collected on 27th)
Type of sample: ft bottom sediment (sand) from the intertidal area
Sample collected by: Mr. Rashid Usmani
Sample analyzed by: Dr. Javed Mustaquim of Karachi University

INTRODUCTION

Benthos is the community of organisms that live either on the surface of the sediment (epifauna) or burrowing in the sediment (infauna). They are classified into three groups on the basis of size: macrobenthos, meiobenthos, and microbenthos. Macrobenthos are greater than 1 mm in size. These organisms are visible with the unaided eye and include such animals as segmented worms, bivalves, gastropods, echinoderms, and crustacean like crabs etc. Meiobenthos comprises of those organisms that pass through 1 mm sieve but retained on 0.1 mm (or more precisely 0.062 mm) sieve. These organisms include foraminiferans, nematodes, gastotrichs, copepods etc. They are hardly visible with naked eye. Microbenthos comprises of those organism that pass through 0.1 mm sieve and includes protozoans, bacteria etc. They can only be seen under microscope. Another group of benthos is recognized by some authors, namely ‘megafauna’ (Smith and Hamilton, 1983). Megafauna are defined as organism that can be retained on a 30 mm sieve. They have low densities are too mobile and hence the usual benthic sampling
gears do not sample them adequately. This ‘megafauna’ should not be confused with that of terrestrial ecosystem where it is defined as organisms weighing more than 45 kg.

The use of macrobenthos to ascertain the overall health status of coastal ecosystem is the most suitable, reliable, and widely acclaimed method (Olomukoro and Dirisu, 2014). Macrobenthos are ecologically important and dominant group of benthic communities. They meet several criteria that render them highly recommendable for inclusion in marine monitoring programmes. They are numerically dominant, have relatively low dispersion and mobility capabilities, and live in direct contact with sediment.

A literature review (excluding ‘gray literature’) shows that macrobenthos of the area near Keamari gryone has not been studied so far. However, macrobenthos from nearby Clifton beach have been reported by such workers as Mustaquim (1991, 2000), Tahera (1996, 2006), Ahmed and Hameed (1999), Rasheed and Mustaquim (2003, 2005) and Imran et al. (2014).

The purpose of this report is to document species diversity and abundance of macrobenthos in the soft-bottom sediment of proposed site for coal stacking yard in the vicinity of Keamari gryone.

**MATERIALS AND METHODS**

Sediment samples were collected from intertidal zone of the Keamari coast during low tide. Two preliminary / pilot samples were collected, at random, on 9th December 2014 and are denoted by P1 and P2 hereafter. Sample P1 was taken with a hand-held coring device 10 cm in diameter, to a depth of about 15 cm while sample P2 was taken with a small spade covering an area of 0.1 m$^2$, to a depth of about 15 cm.

In the laboratory, each sample was sieved on a 1.0 mm sieve. Seawater filtered through a 0.5 mm sieve was used for sieving. The residue fixed in 5% formalin. Animals were sorted under stereomicroscope and preserved in a preservative made up of glycerin, formalin, ethanol and distilled water. All specimens were identified up to lowest possible taxonomic level with the help of following literature: Tirmizi (1977), Mustaquim (1997), Tirmizi and Zehra (1982), and Radasheevsky (2012).

After this preliminary examination, a more comprehensive sampling was done on 27th December 2014 during low tide, using stratified sampling technique. Three transects – A, B, and C – were laid on soft bottom substrata, normal to shoreline, approximately 50 m apart. On each transect three stations – 1, 2, and 3- were marked, at equidistant, from high water to low water level. Transect A, for example, had three stations denoted by A1,
A2, and A3; transect B had B1, B2, and B3; and transect C had C1, C2, and C3. At each station, sand was collected from an area of 0.1 m² (0.32 x 0.32 m) to a depth of 15 cm, with the help of a small spade. Samples were sieved; organisms –if any- were sorted out and preserved, and identified as described above.

RESULTS

Macrobenthos found in the samples are listed in Table 1. Sample P1 contained six specimens of polychaete worm, *Scolelepis* sp, belonging to family Spionidae. They varied from 8 to 14 mm in length (excluding palps) and about 0.6 to 0.8 mm in body width (excluding parapodia and gills). Sample P2 yielded a total of 11 specimens; one mole crab (*Emerita holthuisi*), one snail (*Oliva* sp), and nine polychaete worms, *Scolelepis* sp. The size of the mole crab was 20 mm in carapace length. This mole crab was egg-bearing female. *Oliva* sp. was 18 mm in length. Spionid worms ranged from 8 to 12 mm in length (excluding palps) and 0.6 to 0.8 mm in body width (excluding parapodia and gills).

Out of nine samples collected on 27th December, only two samples, B2 and C2, contained 5 and 8 polychaete worms (*Scolelepis* sp), respectively. Their size varied from 9 to 16 mm in length (excluding palp) and about 0.6 to 0.8 mm in body width (excluding parapodia and gills). No organism was found in the remaining seven samples (A1, A2, A3, B1, B3, C1, and C3).
Table 1. Benthos found in the sediment from the Keamari coast in December 2014

<table>
<thead>
<tr>
<th>Phylum</th>
<th>Class</th>
<th>Family</th>
<th>Scientific name</th>
<th>Common name</th>
<th>Number of specimens in the sediment from each stations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>P1</td>
</tr>
<tr>
<td>Annelida</td>
<td>Polychaeta</td>
<td>Spionidae</td>
<td><em>Scolelepis</em> sp</td>
<td>Spionid worm</td>
<td>6</td>
</tr>
<tr>
<td>Arthropoda</td>
<td>Crustacea</td>
<td>Hippidae</td>
<td><em>Emerita holthuisi</em></td>
<td>Mole/ sand crab</td>
<td>-</td>
</tr>
<tr>
<td>Mollusca</td>
<td>Gastropoda</td>
<td>Olividae</td>
<td><em>Oliva</em> sp.</td>
<td>Sea snail</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total number of specimens in the sample</td>
</tr>
</tbody>
</table>
DISCUSSION

When a coastal ecosystem is affected by pollution, species richness or diversity in that area decreases while the abundance and biomass of a few tolerant species increases. These tolerant species are sometimes referred to as pollution indicator species. Many species of Polychaete worms, including spionid worms, are considered pollution indicators (Giangrande et al. 2005; Dean, 2008) while species of Amphipoda (crustaceans), for example, are considered sensitive to pollution (de-la-Ossa-Carretero et al. 2011).

Polychaete worms have been extensively used in coastal studies for monitoring purposes especially in soft-bottom habitat (Crema et al., 1991; Solis-Weiss et al., 2004). Among benthic groups, polychaetes are, in fact, one of the best indicators of environmental disturbance, since this taxon contains both sensitive and tolerant species in a gradient from pristine to heavily disturbed habitats (Pocklington and Wells, 1992). However, polychaete assemblages have rarely been utilized in hard bottom monitoring programmes (Giangrande et al. 2005).

The duration of the entire life cycle of many species of polychaetes is often on the order of weeks or months and reproductive rates may be very high, both of which allows a rapid population response to any changes in the environment such as the input of pollutants or organic material.

The presence of only one species of spionid worms in the sediment samples indicates that the area does not support healthy growth of benthic communities. The area is almost barren or unproductive. Species diversity is zero. The presence of a single mole crab and a sea snail, in sample P2 only, may be accidental as these organisms move with the tidal current and burrow in the sand when exposed to air.

From nearby Clifton beach, Ahmed and Hameed (1999) reported 28 taxa of macrobenthos from the sediment in December 1994. Other macrobenthic organisms which have been reported from Clifton beach include several species of polychaetes (Mustaquim, 1991, 2000; Rasheed and Mustaquim, 2003, 2005), crabs and shrimps (Imran et al. 2014), mollusc (Tirmizi and Zehra, 1982) and echinoderms (Tahera, 1996, 2006). Absence of all these species in the area investigated clearly shows that it is under severe stress and not suitable for benthic organisms to colonize it.

Some endangered species, such as Chelonia mydas (turtle), which nests on Sandspit beach, was not found in the Keamari coast. Obviously it is not a suitable place for turtles
to visit and lay eggs. Similarly, corals and sea-grasses have never been reported from the area.

**CONCLUSION**

The results of the present investigation show that the area is very poor in species richness and abundance, which may be attributed to pollution or dredging in the area.

**REFERENCES**


Meticulous Management of Coal Handling


Tirmizi N.M. and Zehra I. 1982. Illustrated key to families of Pakistani molluscs. Pakistan Science Foundation, Islamabad. 46 pp

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Visiting Professor
Institute of Environmental Studies
University of Karachi
(Former Director and Professor of Marine Biology at University of Karachi)
4.7 Air Quality

The atmospheric pollution caused by coal dust is perhaps its most adverse impact on environment, detrimental to life and property in a variety of manners. As this environmental study is being done at the post operational stage, the baseline cannot be established except for relying on data available from past records. Hence data available from the baseline criteria of environmental study of Pakistan Deep water Container Port which is in the same area, can serve as baseline for this project. In this regard the chart of National Environmental Quality Standards of Pakistan and the ambient air quality data recorded by Suparco in 2009 are as under.

**Dust:**

Normally there is no dust in the project area during the monsoonal winds. At times the winds blowing from Manora side may bear sand dust. Particulate matter recorded by SUPARCO is shown in the chart below. The National Environmental Quality Standards are also listed for ready reference.

**a. Pakistan NEQS for Industrial Gaseous Emissions**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Parameter</th>
<th>Sources of Emission</th>
<th>Maximum Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Smoke</td>
<td>Boilers &amp; furnaces:</td>
<td>Smoke capacity not to be exceed 40% or 2 on Ring leman Scale</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-Using oil</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-Using coal</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-Cement</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Particular matter ¹²</td>
<td>Grinding, crushing, clinkers, coders, &amp; related processes; metallurgical processes, converters, blast furnaces &amp; cupolas</td>
<td>300mg/NM³</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>500mg/NM³</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>200mg/NM³</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>500mg/NM³</td>
</tr>
<tr>
<td>3</td>
<td>Hydrogen Chloride</td>
<td>Any</td>
<td>400mg/NM³</td>
</tr>
</tbody>
</table>
### Meticulous Management of Coal Handling

#### Chlorine
- Any
- 150mg/NM³

#### Hydrogen fluoride
- Any
- 150mg/NM³

#### Hydrogen Sulfide
- Any
- 10mg/NM³

#### Sulfur oxide
- Sulfuric acid plants
  - 400mg/NM³
- Others
  - 400mg/NM³

#### Carbon monoxide
- Any
- 800mg/NM³

#### Lead
- Any
- 50mg/NM³

#### Mercury
- Any
- 10mg/NM³

#### Cadmium
- Any
- 20mg/NM³

#### Arsenic
- Any
- 20mg/NM³

#### Copper
- Any
- 50mg/NM³

#### Antimony
- Any
- 20mg/NM³

#### Zinc
- Any
- 200mg/NM³

#### Oxides of nitrogen
- Any nitric acid manufacturing units
  - 400mg/NM³
- Other sources
  - 400mg/NM³

---

b. A three days air quality including noise analysis on 15 minutes basis was conducted by Pakistan Space and Upper Atmosphere Research Commission in Feb 2009. Results of tests conducted adjacent to the project area are at the end of this section. The concentration of different gasses during the survey was found to be in following ranges.

- **Sulphur di oxide**: 14 ppb to 29 ppb
- **Nitrogen oxides**: 14.7 ppb to 51.9 ppb
- **Carbon mono oxide**: 2.96 ppm to 4.63 ppm
- **Carbon di oxide**: 338 ppm to 361 ppm
- **Particulate matter-10**: 126 µg/m³ to 148 µg/m³
- **Noise**: 42 dB to 58 dB
The concentration of the following parameters in the ambient air within the premises and a distance of 10 meters from the source (other than the stack/vent) shall not exceed the following levels.

<table>
<thead>
<tr>
<th>PARAMETERS</th>
<th>PERMISSIBLE LIMIT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Annual</td>
</tr>
<tr>
<td>Particulate Matter-10 (PM$_{10}$)</td>
<td>60 Microgram/M$^3$</td>
</tr>
<tr>
<td>Particulate Matter-2.5 (PM$_{2.5}$)</td>
<td>40 Microgram/M$^3$</td>
</tr>
<tr>
<td>SO$_2$</td>
<td>50 Microgram/M$^3$</td>
</tr>
<tr>
<td>NO$_x$</td>
<td>40 Microgram/M$^3$</td>
</tr>
</tbody>
</table>

The above data relates to the study on PDWCP. However, with the handling of coal in increased quantum the Particulate Matter in the area has increased substantially. To assess the impact of fugitive dust emissions in the surrounding localities an ‘Air Dispersion Computerized Modeling’, based on 5 years weather data was done. This is discussed in detail in Section 5(Impact Identification).

Mean levels of pollutants throughout a 24 hour cycle (over three days)

<table>
<thead>
<tr>
<th>Time</th>
<th>SO$_2$ (ppb) Mean</th>
<th>NO$_x$ (ppb) Mean</th>
<th>CO (ppm) Mean</th>
<th>CO$_2$ (ppm) Mean</th>
<th>P. M.($\mu$g/m$^3$) Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>0015-0300</td>
<td>18.14</td>
<td>26.62</td>
<td>3.85</td>
<td>347.58</td>
<td>137.39</td>
</tr>
<tr>
<td>0315-0600</td>
<td>16.11</td>
<td>21.52</td>
<td>3.83</td>
<td>349.19</td>
<td>136.83</td>
</tr>
<tr>
<td>0615-0900</td>
<td>17.25</td>
<td>23.81</td>
<td>4.09</td>
<td>350.03</td>
<td>130.75</td>
</tr>
<tr>
<td>0915-1200</td>
<td>18.58</td>
<td>30.13</td>
<td>4.11</td>
<td>347.92</td>
<td>133.72</td>
</tr>
<tr>
<td>1215-1500</td>
<td>22.92</td>
<td>32.98</td>
<td>4.09</td>
<td>345.89</td>
<td>133.28</td>
</tr>
<tr>
<td>1515-1800</td>
<td>22.61</td>
<td>32.07</td>
<td>4.10</td>
<td>346.47</td>
<td>131.31</td>
</tr>
<tr>
<td>1815-2100</td>
<td>21.72</td>
<td>35.48</td>
<td>4.19</td>
<td>348.83</td>
<td>133.33</td>
</tr>
<tr>
<td>2115-2400</td>
<td>21.22</td>
<td>33.94</td>
<td>4.14</td>
<td>346.86</td>
<td>137.28</td>
</tr>
<tr>
<td>Overall mean</td>
<td>19.82</td>
<td>29.57</td>
<td>4.05</td>
<td>347.85</td>
<td>134.24</td>
</tr>
</tbody>
</table>

- Average air temperatures for Karachi in February are 20°C. Sunrise is at 0700 hours.
- From the survey results above it can be seen that for SO$_2$, NO$_x$ and CO concentrations increase through the day and fall back again through the early hours of the morning. For CO$_2$ this trend is not apparent.
- Particulate matter varies little through the day with concentrations remaining very close to the overall mean.
4.8 Noise

4.8.1 Background Information

Although Karachi is currently the sixth largest city in the world with quite densely populated areas where Noise levels remain 30 to 35 dB above the Pakistan NEQS for noise of 85dB, the project area remains relatively quite quiet. However the activity in the coal yard, particularly when the coal ship is in the port, involves a large number of trucks which produce excessive engine sound. As during the study the coal ships were forbidden in Karachi port, the trucks movement was restricted to keep the general noise remained well within NEQS. Noise close to the loaders was found on the higher side.

4.8.2 Past Record

A three day noise survey was undertaken by the Pakistan Space and Upper Atmosphere Research Commission in February 2009 at the same time as the air quality survey (Section 4.07). Full results of the survey are available in the Suparco,s result sheets at the end of this section. The range of values recorded was between 41 and 58dB.

<table>
<thead>
<tr>
<th>Time</th>
<th>Mean (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0015-0300</td>
<td>45.47</td>
</tr>
<tr>
<td>0315-0600</td>
<td>44.28</td>
</tr>
<tr>
<td>0615-0900</td>
<td>44.39</td>
</tr>
<tr>
<td>0915-1200</td>
<td>47.58</td>
</tr>
<tr>
<td>1215-1500</td>
<td>51.33</td>
</tr>
<tr>
<td>1515-1800</td>
<td>52.08</td>
</tr>
<tr>
<td>1815-2100</td>
<td>50.03</td>
</tr>
<tr>
<td>2115-2400</td>
<td>49.47</td>
</tr>
<tr>
<td><strong>Overall mean</strong></td>
<td><strong>48.08</strong></td>
</tr>
</tbody>
</table>

The Pakistan NEQS for noise is 85dB. Based on this standard the results of the survey in 2009 do not exceed this NEQS.

4.8.3 Recommendation

In order to fully assess noise quality in the project area a further noise survey should be undertaken as the latest information currently available may be conservative and further testing may indicate higher noise levels.
4.9 Marine Ecosystems

4.9.1 Marine habitats on the Karachi Coast

In general, the coast of Pakistan consists of a wide variety of habitats including wetlands, in particular mangroves formed into coastal systems including coastal lagoons, marsh communities, algal beds and estuaries. Certain areas in Karachi Harbour carry mangrove conglomerations and various creeks and backwater habitats. The locations of mangrove forests nearest to the project area are shown in the figure below. The mangrove forests are dominated by one particular species, namely *Avicenna marina*.

Mangroves in Karachi Harbour

![Mangroves in Karachi Harbor](image)

<table>
<thead>
<tr>
<th>Habitat</th>
<th>Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Backwaters</td>
<td>900</td>
</tr>
<tr>
<td>Eastern Backwaters</td>
<td>83</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>983</strong></td>
</tr>
</tbody>
</table>

4.9.2 Marine Life – Phytoplankton

The satellite image of the Arabian Sea including Pakistan show regions of chlorophyll concentrations. High chlorophyll concentrations indicate that tiny ocean plants, called phytoplankton, are thriving near the ocean’s surface. The plants can both nourish and destroy a marine ecosystem.

Phytoplankton is a major source of food for many marine animals. Regions that produce large amounts of phytoplankton also tend to support a thriving fish population. But when phytoplankton concentrations get to be too great, they can create “dead zones” in the ocean’s oxygen-poor regions where few, if any, fish can survive. Dead zones occur when phytoplankton die and begin to sink to the sea floor. Bacteria
break down the plants, and if the concentration of decaying plants is high enough, the bacteria can consume all of the oxygen in the region.

**Phytoplankton Study on the Karachi Coast**

The coastal waters along Clifton and Manora beaches seem to be highly productive. Studies on phytoplankton which have focused on Karachi Harbour and Manora channel recorded the presence of 8 general and 52 species of thecate dinoflagellates in Manora Channel. 101 species of centric diatoms have been recorded in the harbour belonging to 30 genera, which is a more diverse flora than that recorded from the Arabian Sea coastal waters (DHA, circa 2007). This diversity may be explained by the variety of salinities and the diversity of aquatic habitats in the creek system.

Species composition of diatoms in Karachi Harbour and outside Manora Channel has changed over the last two decades In mangrove habitat of the Sandspit area the bloom of *Naviculula cancellata*, a pennate diatom, was reported for the first time in NE monsoon season in 1992 (DHA, circa 2007).

4.9.3 **Zooplankton**

Studies undertaken on the zooplankton abundance indicate that that copepods, *chaetognaths*, *coelenterate medusa* (jelly-fishes), *pteropods* (mollusc), *krill euphausiids*, fish-eggs and larvae (ichthyoplankton), crab larvae (*Zoea*) and shrimp larvae (*Zoea* and *Mysis*) are the most common groups of zooplankton found in the coastal waters of Pakistan (DHA, circa 2007).

It is also evident from these studies that the Arabian Sea zooplankton biomass remains high throughout the year. However, the distribution and abundance of zooplankton may be influenced by the two monsoons (southwest and northeast monsoons) which prevail in this region (DHA, circa 2007).

4.9.4 **Benthos**

The Manora Channel and the berthing area of the harbour are subject to sedimentation due to the combined inputs from the Lyari River outflow and tidal movements that sweep sediments into the harbour area. The sedimentation is kept under control by dredging. This activity has a drastic effect on the natural benthos that is thus constantly removed.

Oyster Rocks have the potential to support a range of benthic invertebrates however no site specific surveys have been undertaken here.

4.9.5 **Turtles**

The Sandspit / Hawksbay recreational beaches, habitat to the endangered green turtle *Chelonia mydas*, are located approximately 6km west of Manora. The Green Turtles
enjoy a protected status. The Sandspit / Hawksbay beaches represent the most important turtle nesting and breeding habitat in Pakistan. Plate 4.2 shows the typical habitat for turtle nesting at Sandspit / Hawksbay Beaches.

4.9.6 Coral Reefs and Sea-Grass Beds

The nearest coral reefs are near Churna Island which is around 20 nautical miles from the project area. More than 60 types of coral are known to be found here, and many new corals are starting to flourish following the 2005 Tsunami in the Indian Ocean. This is a popular area for scuba diving.

Sea-grass beds are located off the coast, with the closest area approximately 6 nautical miles west of the project area.

4.10 Fisheries

The fishes commonly found along these beaches include mullet, cat fish, sciaenid fish, lady fish, file fish and others. The fishing in the Clifton beach area which is near the project is generally carried out during SW monsoon when the fishermen cannot go for open fishing.

4.11 Landscape

4.11.1 Introduction

The landscape is defined as the area which starts at the coastline and includes all areas inland even where there are no views or direct experience of the sea.

By contrast, the seascape is defined as the coastal landscape and adjoining areas of open water, including views from land to sea, from sea to land and along the coastline.

Essentially the term ‘seascape’ is therefore an extension of the ‘landscape’ concept to take account of open water beyond the mainland.

4.14.2 Project Area Landscape
As would be expected from a make-shift coal yard the landscape cannot be pleasing or enjoyable. The above photos show that uplift of the area can improve landscape without much effort.

4.12 Seascape

The seascape, as seen from the coal yard is also not very attractive because of the deep port construction work. However upon completion of PDWCP the seascape is expected to be very impressive as it incorporates a view of Oyster Rocks.

4.13 Socio-Economic Condition

4.13.1 Cultural Heritage

The project area does not include any cultural heritage. Also the project is purported to minimize the impact of coal dust on all buildings including any cultural building in any nearby locality. The nearest relevant building is the Keamari Clock Tower and Mule Mansion which was built in 1912 at a distance of approximately 1.5 km from the project.
site. The Mosques at Gate No.1 Keamari, Coast Guard Building and Keamari Groyne were all found to have been affected by coal dust.

4.13.2 **Archaeological Assessment**

No construction of archaeological importance exists in the project area.

4.13.3 **Population**

There are 8 Union Councils of Karachi having a population of 383,378 which are adjacent to the Karachi Port. The population of these Union Councils is given in Table below.

Population data in nearest localities.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>01</td>
<td>Bhutta Village</td>
<td>62,125</td>
</tr>
<tr>
<td>2</td>
<td>02</td>
<td>Sultanabad</td>
<td>49,544</td>
</tr>
<tr>
<td>3</td>
<td>03</td>
<td>Keamari</td>
<td>55,420</td>
</tr>
<tr>
<td>4</td>
<td>04</td>
<td>Baba Bhit</td>
<td>19,043</td>
</tr>
<tr>
<td>5</td>
<td>05</td>
<td>Machar Colony</td>
<td>58,785</td>
</tr>
<tr>
<td>6</td>
<td>06</td>
<td>Mauripur</td>
<td>47,925</td>
</tr>
<tr>
<td>7</td>
<td>07</td>
<td>Shershah</td>
<td>53,480</td>
</tr>
<tr>
<td>8</td>
<td>08</td>
<td>Gabo Pat</td>
<td>38,055</td>
</tr>
</tbody>
</table>

Total 8 Union Councils 383,378
4.13.4 **Villages near Project area**

Most of the localities mentioned above are partly living in a village style.

**The main villages/towns near the project area are Keamari, Monora, Sultanabd, Bhutta village and Baba Bhit, and Gabo pat.**

4.13.5 **Religion Ratio near Project Area**

According to the census of Pakistan 1998, the religious breakdown of the city is as follows: Muslim (96.45%), Christian (2.42%), Hindu (0.86%), Ahmadi (0.17%) and other (0.10%). Other religious groups include Parsis, Sikhs, Bahai, Jews and Buddhists.

4.13.6 **Mother Language**

The most commonly spoken language in Karachi is Urdu, the national language. Other national languages spoken in Karachi are Sindhi, Punjabi, Pashto and Balochi are widely spoken in the city.

4.13.7 **Ethnicity/Tribes near the project area**

The population of the project area is a mixture of various heterogeneous groups and cultures. The main tribes are Talpur, Memon, Syeds Baluchs, Somro, Mirzas, Sheikh, Khatris, Qureshis, Abbasis, Bhurgari, Lashari, Laghari, Ranghar, Panwhar, Halepota, Mari, Banglani, Gorchani, Khosa, Sameja, Gurgaj, Bhanbhro, Jat, Arain, Qureshi and Sheikh. Many people from Punjab and NWFP have settled in the project area.

4.13.8 **Main Occupation dwellers near the project area**

The entire community in the nearby islands has a fisheries based economy and there is a tendency among the young men to search employment in shipping related services and on passenger/pleasure boats. The contribution of women in earning livelihood is minimal. A good number of workers in coal yard belong to the above named localities.

4.13.9 **Industry**

There are more than 300 industrial units in the Timber Pond and Oil Installations Area providing skilled and unskilled employment to thousands of local people. The industrial units vary from small-scale industry to medium sized Engineering/processing Works.
4.13.10 Other facilities of Life

The availability of basic amenities of life to the community living in the project area is an indicator of its socio-economic conditions.

Health Facilities: The city is home to at least 30 public hospitals and more than 80 private hospitals. In close vicinity to the area, there is a Karachi Port Trust Hospital, providing health facilities to the KPT workers.

4.13.11 Education Facility

There is a rising trend of sending children to schools. A school at Baba Island being run by Navy League has a capacity of 400 students. In 2008-09, the city's literacy rate was estimated at 65.26%, the highest in Pakistan, with a gross enrolment ratio of 111%, the highest in Sindh.

Education in Karachi is divided into five levels: primary (grades one through five); middle (grades six through eight); high (grades nine and ten, leading to the Secondary School Certificate); intermediate (grades eleven and twelve, leading to a Higher Secondary School Certificate); and university programs leading to graduate and advanced degrees. Karachi has both public and private educational institutions. Most educational institutions are gender-based, from primary to university level.

4.14 Services

Power Supply:

The project area is served from the K-Electric distribution system but being insufficient and unreliable the users tend to use their own generators. There engines run on diesel oil.

Water Supply and drainage:

No water supply or used water drainage system is available in the area. Even the rain wash flows into the sea.

4.15 Recreation and Tourism

The area and the activities here do not support any tourism in the area. Even before using the area for coal, it had no potential for Tourism.

4.16 Traffic and Transport
**Transportation:**

The cargo transportation is by trucks, dumpers and even 16-24 wheelers. The nearest Public transport (buses etc) is available at Keamari bus stop at 1.5 km from the project area. However private cars are allowed to move freely in the area. Except for localized impact during cargo discharge operation there is no report of Traffic in the area.

4.17 Health

4.17.1 Health status of people living in Coal Dust

The health impacts of respirable coal dust on underground coal miners, exposed to high levels of coal dust for extended periods, are well known and incontrovertible. There may also be severe risks of exposure to lower levels of coal dust. The dust emission from the terminal processing, storage and shipping of coal, can lead to even higher fugitive emissions, approximating those of an open pit coal mine. Also coal dust in all size fractions contains varying amounts of heavy metal contaminant such as Lead, Mercury, Chromium and at times even Uranium, depending on the origin of coal. Whether this contamination will lead to a substantial health impact deserves further study.

Surprisingly none of the worker within the coal yard complained of any health problems although they are not using any breathing masks or other protective devices.

To study the human health baseline in the area in the context of fugitive coal dust emissions a survey was conducted by the medical member of EIA team, Dr. Nabi-Ullah. He has reported that the clinics in the area have noted an increase in the number of cases of asthma and other respiratory diseases some of which could be linked to inhalation of coal dust.

4.18 Safety

After health, Safety appears to be the most neglected issue of the workers in the yard. The use PPEs was found to be below minimal. Although the working firms had the PPEs in their stores but as per their statement the workers regard the PPEs to be a burden while working.

Also movement of trucks and heavy machinery on top of the coal heaps is very risky. Fire protection or fire-fighting equipment are not visible anywhere. The Stevedore’s rep., explained that this coal does not catch fire. He actually meant that spontaneous ignition cannot take place but he has ignored the chance accidental or terrorist initiated fires after which the entire yard and adjacent oil installations area can be put to a great risk. These aspects are further discussed in Sections 5 & 6.

AIR QUALITY ANALYSIS DATA SHEETS
(Ref Para 4.7b)

Pakistan Space and Upper Atmosphere Research Commission

Site No: One (Keamari Groyne Area)

<table>
<thead>
<tr>
<th>DATE</th>
<th>TIME</th>
<th>SO₂ (ppb)</th>
<th>NOₓ (ppb)</th>
<th>CO (ppm)</th>
<th>CO₂ (ppm)</th>
<th>PM-10 (µg/m³)</th>
<th>Noise (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18/02/2009</td>
<td>10:00</td>
<td>18</td>
<td>32.2</td>
<td>4.3</td>
<td>348</td>
<td>136</td>
<td>49</td>
</tr>
<tr>
<td>18/02/2009</td>
<td>10:15</td>
<td>19</td>
<td>31.6</td>
<td>4.18</td>
<td>357</td>
<td>132</td>
<td>50</td>
</tr>
<tr>
<td>18/02/2009</td>
<td>10:30</td>
<td>17</td>
<td>32.5</td>
<td>4.16</td>
<td>352</td>
<td>135</td>
<td>54</td>
</tr>
<tr>
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Section 5
POTENTIAL IMPACT IDENTIFICATION

CONTENTS

5.1 Impact Assessment Strategy
5.2 Summary of key activities and potentially affected attributes
5.3 Issues of Critical Importance
5.4 Impact on Human Health
5.5 Impacts on sensitive environmental sites
5.6 Air Dispersion Modeling
5.7 Safety
5.1 Impact Assessment Strategy

This section discusses the strategy adopted for assessing the environmental impacts of the proposed project, “Meticulous management of ‘coal handling’ at Karachi Port”.

5.1.1 Impact Identification

The method adopted for assessing the environmental impacts of the proposed project, included three separate steps:

1) Initially, all the project activities were detailed separately;
2) The activities were then linked with the environmental resources that could be affected which led to the identification of the expected environmental impacts, both short term and long term. A detailed Screening Matrix was developed to facilitate the prioritization of the environmental issues earlier identified; and
3) The form and type of the appropriate mitigation measures to be adopted to overcome the significant adverse environmental impacts were than separately indicated.

5.1.2 The EIA Process

Environmental Impact Assessment (EIA) is a means of drawing together, in a systematic way, an assessment of a project's likely significant environmental effects. This helps to ensure that the importance of the predicted effects, and the scope for reducing them, are properly understood by the public and the relevant competent authority before it makes its decision.

5.1.3 Defining Significance

In order to portray the identified significance of a project on specific parameters and receptors, a consistent set of significance levels have been applied to impacts throughout this EIA. The levels of significance applied are shown below.

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<th>Impact Significance</th>
<th>Impact Characteristic</th>
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<td>Major beneficial</td>
<td>The impact is large scale, giving rise to a significant gain to the environment.</td>
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<tr>
<td>Moderate beneficial</td>
<td>The impact will provide a positive gain to the environment.</td>
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Minor beneficial  The impact is minor but has some environmental benefit.
No impact  No impact.
Negligible  The impact is of no concern.
Minor adverse  The impact is undesirable but of limited concern. Mitigation may be applicable to further reduce the impact significance.
Moderate adverse  The impact gives rise to some concern but is likely to be tolerable in the short-term (e.g. during the construction phase); mitigation to reduce the impact should be sought or the issue will require a value judgment as to its acceptability.
Major adverse  The impact is large scale, giving rise to great concern; it should be considered unacceptable and requires mitigating, compensating or a significant change to the development if no alternative is available. If no mitigation is possible, then the impact will require a value judgment as to its acceptability.

A number of criteria have been utilized to determine the significance of the environmental impacts, including:
- Magnitude of the impact (e.g. local, regional or national);
- Spatial extent of the impact (i.e. small scale or large scale);
- Relevance of the impact (i.e., direct or indirect impact);
- Duration of the impact (i.e. short term or long term);
- Reversibility of the impact including species or habitat recoverability, sensitivity and tolerance;
- Probability of occurrence of the impact;
- Sensitivity of the receiving environment (e.g. statutory and non-statutory designations);
- Number of receptors affected (including their conservation or protected status);
- Confidence in the impact prediction; and
- The margins by which set values are exceeded (e.g. water quality standards).

Where appropriate, existing guidelines were used to formulate the definitions and for certain topics the derivation of significance considers other criteria such as guidance on sediment quality and water quality. For all topics, the magnitude of the impacts and sensitivity of the receiving environments, whether adverse or beneficial, were categorised as:
- High;
- Medium; or
- Low.

Whenever possible, the following formula was used to calculate the level of significance:
Significance = Magnitude of Impact x Sensitivity of the Receptor to the Effect

This formula provides a better appreciation of the fact that as the sensitivity of the receptor and the magnitude of the effect (accounting for impact frequency, extent and timescale) increases, so the significance of the effect increases.

However, for some technical topics, particularly where definition of quantitative criteria for assessment is not feasible, professional judgment was applied to the evaluation of impact significance. The judgement was primarily based on recognized guidelines or standards where possible but also on other factors including experience of similar schemes and technical knowledge of the sensitivity and vulnerability of the receptor, the magnitude of the change and the likelihood of impact.

5.1.4 Mitigation and residual impacts

Mitigation measures i.e. means by which impacts might be prevented, removed, reduced or managed, have been provided where potentially significant adverse impacts have been identified. These measures are outlined in Section 6.

5.2 Summary of key activities and potentially affected attributes

Any proposed development project may have adverse or beneficial environmental impacts. The extent of these impacts depends on the nature and magnitude of the proposed activities and the type and sensitivity of the host environment.

These factors also determine the required depth of the environmental assessment to be carried out for the proposed project.

Accordingly the project of “Meticulous management of ‘coal handling’ at Karachi Port” has been assessed for all environmental attributes but following the screening process described above the key activities and attributes are summarized below. The screening matrix provides further detail on the impacts assessed and their potential significance.

5.2.1 Coal. An Environmental Adversary?

“Where There is Coal, There Will be Coal Dust.” This saying stands true for all coal related operations all over the world.
5.2.1.1 **Coal**

**Coal** is a combustible black or brownish-black sedimentary rock usually occurring in rock strata in layers or veins called **coal beds** or **coal seams**. The harder forms, such as anthracite coal, can be regarded as metamorphic rock because of later exposure to elevated temperature and pressure. Coal is composed primarily of carbon along with variable quantities of other elements, chiefly hydrogen, sulfur, oxygen, and nitrogen.

Throughout history, coal has been used as an energy resource, primarily burned for the production of electricity and/or heat, and is also used for industrial purposes, such as refining metals. A fossil fuel, coal forms when dead plant matter is converted into peat, which in turn is converted into lignite, then sub-bituminous coal, after that bituminous coal, and lastly anthracite. This involves biological and geological processes that take place over a long period. The US Energy Information Administration estimates coal reserves at $948 \times 10^9$ short tons (860 Gt). One estimate for resources is 18 000 Gt.

Coal is the largest source of energy for the generation of electricity worldwide, as well as one of the largest worldwide anthropogenic sources of carbon dioxide releases. In 1999, world gross carbon dioxide emissions from coal usage were 8,666 million tonnes of carbon dioxide. In 2011, world gross emissions from coal usage were 14,416 million tonnes. Coal-fired electric power generation emits around 2,000 pounds of carbon dioxide for every megawatt-hour generated, which is almost double the approximately 1100 pounds of carbon dioxide released by a natural gas-fired electric plant per megawatt-hour generated.

5.2.1.2 **STORAGE OF COAL: PROBLEMS AND PRECAUTIONS**

Coal can be stored in large quantities if required because of some necessities. Although stacking is generally done in open areas, there are also covered stack areas or completely closed coal silos.

Produced coal is generally loaded in trucks or wagons by excavators and loaders to be transported to the storage areas. In many countries various stacking techniques are applied by taking some factors into account such as climate conditions, dimensions and design of storage and machinery used for this purpose. Widely used methods like Windrow, Chevron and Cone Shell type are explained with their main characteristics in Section 6.

The problems faced in coal stacks and factors affecting the spontaneous combustion of coal like coalification degree, petrographic composition, moisture content, mineral content, particle size, pyrite content are discussed independently.

Some reasons for coal storage are given below:

- Decrease of demand for coal in the market,
To be ready for the bottlenecks caused by the halts which may occur in production,
To meet the consumers’ demand without interruption,
To produce in mild climate conditions and market it in winter,
To decrease the moisture content of coal,
The defects which may occur in thermal power stations and washing plants,
To feed the thermal power stations continuously with coal of specified properties.

However, some negative developments are observed in various characteristics of coal and important problems may emerge because of its long time storing in open areas. Consequently, stocking of coal has to be done consciously and by respecting basic rules.

5.2.1.3 **General Methods of Coal Stacking**

Produced coal is generally loaded in trucks or wagons by excavators and loaders to be transported then to the storage areas. Belt conveyor is another transportation alternative.

In recent years, the increased transportation capacities of trucks, their ability to function in topographic irregularities, and their easy adaptation to the changes in working areas are the reasons for preference of transportation by trucks.

In the enterprises where bucket wheel excavators are used, the transportation of coal to the storage area by means of conveyor belt bridges becomes possible. Same operations are relevant for the transportation of the coal carried by ships from the harbor to the storage area. The coal transported to the storage area is spread by movable or fixed belt systems and according to desired stacking geometry.

In many countries various stacking techniques are applied by taking some factors into account such as the climate conditions, dimensions and design of storage area and the machinery used for this purpose. Three methods that are widely used will be explained in section 6.

5.2.1.4 **Problems Faced in Coal Stacks**

Besides various advantages, stacking presents also some disadvantages. Some of these are listed below:

- Stacked coal is a unprofitable investment and needs supplementary expenses,
- As a result of oxidation, coking property and calorific value of the coal are decreased,
- Oxidation of coal causes an increase in ignition temperature,
- If the coal is fragile, it will be fragmented so the percentage of small particle size material is increased,
Oxidized coal decreases the performance of washing plants, 
As a result of storage of the coals containing high percentage of methane in 
closed silos which are not ventilated as required, explosive gas compositions 
can be formed.

However, the most important of these are the fires caused by self-oxidation of coal. The 
fires cause the loss of natural wealth and money. The gasses formed during the fire and 
the wastes as a result have harmful effects on.

5.2.1.5 Low Temperature Oxidation of Coal and Spontaneous Combustion

The mechanism of reactions between oxygen and coal is quite complicated. These 
reactions occur in four steps as explained below:


2nd Step : Decomposition of these complexes, yielding of CO2 and H2O molecules 
and formation of more sensible groups [carboxyl (COOH), carbonyl (C=O) 
and phenolic (OH)] and heat generation.

3rd Step : Decomposition of these groups, too (at temperatures higher than 
100°C), production of CO, CO2, H2, H2O and high degree hydrocarbons 
(ethane, ethylene, propylene) and heat generation.

4th Step : Decomposition of aliphatic structure, production of CO, CO2 and H2O.

In low temperatures, the first step is developed faster than others. Oxygen molecules 
get connected to the coal surface physically (adsorption) and reaches to the passing 
pores by diffusion. In this stage, since the oxide layer formed with the exposure of coal 
surface to the air prevents the diffusion of oxygen partially, oxidation rate is decreased 
in time.

Researches proved that the physical adsorption of oxygen by coal starts at -80°C, it 
decreases rapidly with increasing temperature and becomes insignificant after 50°C. 
The chemical reaction of oxygen with coal becomes important after -5°C and physical 
adsorption is left behind when the temperature increases over 0°C.

As indicated above, the reactions between oxygen and coal are exothermic. According 
to the findings obtained at the end of various researches, a heat of 2 to 4 calories 
emerges for 1 ml oxygen adsorbed to the coal under normal conditions. The heat 
produced as a result of reactions is generally carried by airflow and there is not any 
significant change in ambient temperature. However, in some cases formed heat cannot 
be carried away from the environment and the temperature begins to increase. The 
reaction gets accelerated and spread over with the increasing temperature; produced 
heat takes the coal to ignition temperature (around 175°C) in suitable conditions and 
open flamed fire begins.
5.2.1.6 Effect of coal on coastal ecosystem (Author: Dr. Javed Mustaqeem)

EFFECTS ON SEAWATER:

Toxicity of Seawater:
There is no direct toxicity from coal mixing with seawater that can be a major threat to the marine environment. This has been stated in a recent study by The Great Barrier Reef Marine Park Authority (GBRMPA, 2010). Polycyclic aromatic hydrocarbons (PAHs) and heavy metals present in the coal are not easily released from unburnt coal (Cabon et al. 2007; Jaffrennou et al. 2007). Thus the impact of coal mixing with seawater is likely to be limited.

Seawater pH / Acidification of Seawater:
Rainwater runoff from coal stockpile may be acidic due to oxidation of pyrite into sulphuric acid. Pyrites are sulphur containing compounds such as iron pyrite (FeS$_2$). The concentration of pyrite in coal is variable but on average it is about 0.5%. The acidic leachates from coal pile may be an environmental problem if rainfall is common in the area and the receiving water-body is a freshwater. In coastal / marine environment impact of the acidic leachates is negligible due to vast buffering capacity of seawater bicarbonate (Ahrens and Morrisey, 2005).

Seawater Salinity:
“Coal pile runoff is often saline, due to salt formed during the oxidation and dissolution of mineral components of the coal. While coal-generated salinity may not be important for the marine environment from a mass-loading perspective, the elemental composition of coal pile runoff may differ from seawater. However, total dissolved solids (TDS) concentrations of coal pile leachate do not exceed 15 g/litre, makes them less saline than typical seawater (35 g/litre). Because of naturally high salinity of seawater, the salinity inputs emanating from coal storage piles are not likely to have significant ecological effects on marine organisms.”(Ahrens and Morrisey, 2005).

Humic Acid Formation:
Mixing of coal in seawater can increase humic acid concentration (Cabon et al. 2007, Jaffrennou et al. 2007). Humic acid helps break up clay and compacted soils, assists in transferring micronutrients from the soil to the plant, enhances water retention, and stimulates development of microflora populations in soils. Thus it has positive impact on coastal ecosystem. Sardessai (1993), from Goa, India, found a positive correlation between mangrove vegetation and humic acid concentration.
**Radioactive Elements:**

Unburnt coal contains uranium and thorium, and a variety of radioactive isotopes from the natural decay series of $^{238}\text{U}$, $^{235}\text{U}$, and $^{232}\text{Th}$, along with traces of $^{40}\text{K}$. Concentrations of Th and U for most types of coal range between 0.5 – 10 ppm and 0.5 – 20 ppm, respectively (Swaine, 1990), and are generally similar to or lower than concentrations in soil and shale, and therefore do not pose an environmental threat (Ahrens and Morrissey, 2005).

**EFFECTS ON SOFT BOTTOM SEDIMENT:**

Coal has a lower specific gravity than many other components of sediments such as sand and gravel. The specific gravity of coal varies with its ash content, ranging from 1.2–2.9 g cm$^{-3}$ (Alpern, 1977), compared with 2.65 g cm$^{-3}$ for quartz (Brady and Weill, 2002). Transport of coal by water movement may result in larger particles of coal being transported and deposited with smaller, denser particles of sands and gravels. Settling times and, therefore, transport distances will also be greater for a given particle size.

**EFFECTS ON BIOTA:**

It has been reported by Chapman et al. (1966) that although coal can increase PAHs level in the sediment but it does not leach out into the surrounding sediment; hence it is not bioavailable or toxic and does not adversely affect exposed biota. To date there is no published evidence of direct PAH toxicity to marine invertebrates from particulate coal or coal leachates (Ahrens and Morrissey, 2005).

Coal dust deposition on surrounding flora and fauna is considered to be an impact of concern at coal exporting facilities around the world (Naidoo and Chirkoot 2004; Johnson and Bustin 2006; DoIP 2009; GHD 2009).

**Benthic Organisms:**

Suspended particles (either coal or silt and clay) in general may clog feeding and respiratory organs of a wide range of marine animals, reducing efficiency of feeding and respiration and possibly damaging the organs (Wilber and Clarke 2001), or, as in the case of some bivalve molluscs, cause reduction in the rate or efficiency of feeding or cause it to cease altogether (Moore 1977, Bayne and Hawkins 1992). In a study of the effects of coal on ventilation and oxygen consumption in the Dungeness crab (*Cancer magister*), there was no measurable effect over an exposure period of 21 days relative to crabs living in clean water (Hillaby 1981). In this
experiment, however, the coal was mixed into the sand in the bottom of the aquaria, and was not kept in suspension, so the response to suspended material may not have been measured. A previous study (Pearce and McBride 1977, cited by Hillaby 1981), in which some coal remained in suspension throughout the duration of the experiment, reported that particles of coal progressively accumulated in the crabs’ gills. This accumulation may have affected respiration and oxygen uptake although these were not measured in the experiment.

Effects of suspended particles (either coal or silt and clay) may be lethal or sub-lethal and may act directly (e.g., by abrasion, scour or smothering) or indirectly (e.g., by alteration of the nature of the substratum or by modification of processes of predation or competition).

**Mangroves:**
Coal dust can significantly reduce carbon dioxide exchange, photosystem quantum yield, electron transport rate and quantum efficiency in mangroves (Naidoo and Chirkoot, 2004).

Coal dust has the potential to smother mangrove pneumatophores and surrounding soil, reducing oxygen uptake. At present no research has focused on the impacts of coal dust on pneumatophores. However, Ellison (1999) found that increased sedimentation around mangrove pneumatophores can reduce vigour and/or cause mortality.

Other dust related studies state that dust may reduce leaf transpiration, water use efficiency, available photosynthetic active radiation (PAR) through reflectance and absorption and increase leaf temperature (Sharifi et al. 1997; Naidoo and Naidoo 2005). Leaf morphology plays an important role in dust accumulation, features such as salt glands and trichomes increase dust particulates on leaves (Naidoo and Naidoo 2005). Coal dust is unlikely to be toxic to leaves but has the potential to reduce primary production (Sharifi et al. 1997; Naidoo and Chirkoot 2004).

Deposition of coal dust on the surface of plants above and below water may also reduce photosynthetic performance. Mangroves growing around South Africa’s largest coal-exporting port, Richards Bay, accumulate deposits of coal dust on both upper and lower leaf surfaces and on branches and trunks (Naidoo & Chirkoot 2004). The presence of the dust reduced photosynthesis, measured as carbon dioxide exchange and chlorophyll fluorescence, by 17–39%. There was no evidence that coal particles were toxic to the leaves, but mangroves closest to the source of the dust appeared to be in poorer health than those further away. The amount of dust accumulated on leaves...
varied among mangrove species, with *Avicennia marina*, which has relatively hairy leaves, accumulating more than *Rhizophora mucronata*.

### 5.2.1.7 Coal dust and particulate matter background.

Coal dust that could be emitted during transport raises a couple of potential concerns regarding releases to the atmosphere – particle pollution (also called particulate matter or PM), and nuisance dust.

PM is defined as a “mixture of extremely small particles and liquid droplets” found in the air.

PM includes “inhalable coarse particles,” with diameters larger than 2.5 micrometers (µm) and smaller than 10 micrometers and “fine particles,” with diameters that are 2.5 micrometers and smaller.

Nuisance dust would generally consist of the release of dust particles larger than 10 micrometers, which often settles out close to the source and may cause a nuisance by damaging or soilng nearby structures, automobiles, etc.

Coal impact on human health is discussed later in this Section.

### 5.2.2 Coal ‘in’ and ‘out’ procedures

The “Coal ‘in’ and ‘out’” process consists of following stages.

i. Discharge from ship’s hold on to plinth.
ii. Filling up of dumper.
iii. Dumper movement to coal yard.
iv. Discharge in coal yard.
v. Long term stacking in coal yard.
vi. Segregation. (In some cases)
vii. Filling up of railway wagons and trucks.

The action/impact charts are drawn for above activities.

**Discharge from ship’s hold on to plinth.**

<table>
<thead>
<tr>
<th>S.N</th>
<th>Action</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Grab movement in hold.</td>
<td>Dust emission but mostly contained in the hold. Slight impact on men onboard.</td>
</tr>
<tr>
<td>2</td>
<td>Grab opens at a distance from top of heap on plinth.</td>
<td>Atmosphere gets laden with dust in large volumes. Dust settles in remote areas. Impact on men and infra-structure.</td>
</tr>
<tr>
<td>3</td>
<td>Grab discharges directly in Dumpers.</td>
<td>Emissions comparatively reduced.</td>
</tr>
<tr>
<td>4</td>
<td>Dropping of cargo in sea between ship &amp; berth</td>
<td>Minute environmental impact. Continuous dropping for prolonged period would require dredging in the area.</td>
</tr>
</tbody>
</table>
Filling up of dumper.

<table>
<thead>
<tr>
<th>S.N</th>
<th>Action</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dumpers loaded by loaders.</td>
<td>Atmosphere gets laden with dust in large volumes. Impact on men.</td>
</tr>
<tr>
<td>2</td>
<td>Dumpers loaded above the above the hatch level.</td>
<td>Cargo spill on way. Impact on men and infrastructure.</td>
</tr>
<tr>
<td>3</td>
<td>Coal covered by Tarpaulin but tied up insufficiently.</td>
<td>Coal spill on road and in atmosphere.</td>
</tr>
<tr>
<td>4</td>
<td>Not spraying water on complete area and allowing the coal dust to spread in atmosphere &amp; berth</td>
<td>Fugitive dust can reach far off places damaging life and property.</td>
</tr>
</tbody>
</table>
Dumper movement to coal yard.

<table>
<thead>
<tr>
<th>S.N</th>
<th>Action</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Dumper tires carrying spilt coal.</td>
<td>Coal spill on road and in atmosphere.</td>
</tr>
<tr>
<td>2.</td>
<td>Speeding up of dumpers.</td>
<td>Coal spill and turbulence caused in the coal lying on road causing fugitive dust emission.</td>
</tr>
<tr>
<td>3</td>
<td>Dumper’s engine not maintained.</td>
<td>Smoke causing atmospheric pollution.</td>
</tr>
</tbody>
</table>

Discharge in coal yard.

<table>
<thead>
<tr>
<th>S.N</th>
<th>Action</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Indiscriminate dumping of coal.</td>
<td>Aesthetical. Also passage between heaps gets narrowed leaving no space for addressing emergencies.</td>
</tr>
<tr>
<td>2.</td>
<td>Speedy dumping.</td>
<td>Coal dust emission. Localized but can be carried away by wind.</td>
</tr>
</tbody>
</table>
Segregation. (In some cases)

<table>
<thead>
<tr>
<th>S.N</th>
<th>Action</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Uncovered operation.</td>
<td>Massive dust emission. Gets carried away by wind to remote areas.</td>
</tr>
<tr>
<td>2.</td>
<td>Dropping of coal on vibrating screens from top of the heap.</td>
<td>..........................................................</td>
</tr>
<tr>
<td>3.</td>
<td>Separated dust not handled with care.</td>
<td>As the dust is dry it has more potential to fly off even with slight breeze.</td>
</tr>
</tbody>
</table>

Filling up of railway wagons and trucks.

<table>
<thead>
<tr>
<th>S.N</th>
<th>Action</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Loading above hatch level.</td>
<td>Can cause coal spillage and dust emission all over the way till destination.</td>
</tr>
<tr>
<td>2.</td>
<td>Insufficient securing of Tarpaulin.</td>
<td>..........................................................</td>
</tr>
</tbody>
</table>

Coal yard management.

<table>
<thead>
<tr>
<th>S.N</th>
<th>Action</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Congestion in coal yard.</td>
<td>More pollution, aesthetically unpleasant and operational difficulties. Also difficult to address emergencies. No room for firefighting.</td>
</tr>
<tr>
<td>2.</td>
<td>Wetting of pathways.</td>
<td>Aesthetical and operational issues.</td>
</tr>
<tr>
<td>3.</td>
<td>Injection of water in coal to increase moisture.</td>
<td>..........................................................</td>
</tr>
<tr>
<td>4.</td>
<td>Excessive peak height of the heaps due humungous quantum</td>
<td>Vast spread of coal dust and also safety risks for trucks and other machinery working on</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>of coal.</td>
<td>top.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Breached boundary wall</td>
<td>Security risk.</td>
</tr>
<tr>
<td>6</td>
<td>Workers not using PPEs</td>
<td>Safety and health risks.</td>
</tr>
<tr>
<td>7</td>
<td>No fire-fighting equipment/ arrangement could be seen.</td>
<td>Serious safety concern.</td>
</tr>
<tr>
<td>8</td>
<td>Rain/wash water direct drain into sea.</td>
<td>Rainwater runoff from coal stockpile may be acidic due to oxidation of pyrite into sulphuric acid. Not a serious concern for marine env't.</td>
</tr>
</tbody>
</table>

5.2.3 **Aesthetical considerations**

As mentioned in Section 3 the aesthetical status of area within coal yard is pathetic mainly due to following reasons.

i. Indiscriminate use of water in the entire coal yard.

ii. The water which is meant to be sprayed on the top of the heap for suppressing the dust is instead forced in the lower part of the heap for increasing the moisture content of the coal.

iii. Paucity of house keeping efforts as all concerned entities tend to shed responsibility off their shoulders in this regard.
The above mentioned nuisance is not limited to the coal yard only. The coal dust is playing its role in entire surroundings covering almost all plots of oil installations area, oil piers, the under construction PDWCP, Harbour Master’s office, Coast Guards building and even MPCD.

Almost the entire main Keamari road (Bunder road) can be seen littered with coal dust on the edges. But this impact is not directly from coal yard. This dropped from the truck which carry coal to other parts of the country.

Some efforts from all users could have avoided this situation but as mentioned in Section 3, people have become lethargic in the coal laden environment.

5.2.4 Equipment including water spray system, heavy machinery, Segregating equipment, Dumpers, etc.

The equipment in use are working but at the same time causing some adverse impact also.

- The water spray is being used for increasing the moisture content. Hence instead of spray water is jetted into the heap resulting in coal mud spread in the entire coal yard.
- The Segregating equipment are presently causing the biggest nuisance. This is because they are working in open i.e. without restricting the coal dust.
- The dumpers moving in the mud carry the same with the wheels up to quite some distance from the coal yard.

5.2.5 Dedicated Terminal

The impacts mentioned above are to be considered while planning the mechanized dedicated coal terminal.

5.3 Issues of Critical Importance

The Director General, SEPA has submitted following observations related impact of coal dust to Sindh High Court.

- Karachi Port Trust (KPT) was operating a coal-handling terminal in Shireen Jinnah Colony without adhering to the environmental laws. This not only constitute an environmental hazard but also pose serious threat to health of the workers and people living in the vicinity.
- The whole process from unloading of the coal to its dumping and transportation to different industrial units involved serious environmental hazards.
- During inspection, it was noted that the coal material which was found on the berth and jetty flowed into the port waters during washing or at the time of rainfall, causing marine pollution.
• During the transportation of coal through heavy vehicles from the terminal to coal yard, covering distance between 3 and 4 kilometer, the coal dust was flown into the air due to open trucks causing air pollution throughout the route. "It is obvious that hundreds of people in this particular location could be affected from respiratory, eye and other diseases due to the air pollution containing coal dust particles."
• Coal dust was found in the house located in the densely populated area of Keamari and areas in close proximity to the terminal.
• The environmental issues relating to storage of coal were significantly adverse in nature as huge quantity was being stored at the coal yard.
• In view of the coal storage site and its handling in highly densely populated area in highly crude manner, the entire area seems an environmental disaster. The concentration of coal emissions at the site can have very high health impacts to the workers at site as well as public consideration in the vicinity.
• KPT had not obtained its approval for operating coal-handling terminal in the area.

Whereas the above is true to some extent, all these points are to be given due consideration in the mitigation plan.

Some of the impacts can be seen in the following observations during first inspection of the area.

**Some Issues of Concern**

- The security arrangements are very casual at the gate and also inside the yard.
- Housekeeping is very poor. There were no bins for waste material. Roads were slippery.

The heaps of coal are so closely stacked that in case of fire or any other emergency approach is very difficult.

- The height of heaps is much higher than the prescribed levels.

- Workers were not sprinkling the water on the entire heap. Instead they were forcing water jet into the heap to increase its moisture content.

- Water sprinkling was being done by hose pipe through small generators.
No proper attention was given to EHS practice. Even ordinary gas masks were not worn by any worker. No fire extinguishers were seen.

No illumination was available at night.

Screening of coal were being done without any covering on hoppers, conveyors and vibrating screens causing a lot of coal dust going into the atmosphere.

No toilets were available at site.

Drinking water was not available.

5.4 Impact on Human Health

**Health Impacts of Coal Dust**

The health impacts of respirable coal dust on underground coal miners, exposed to high levels of coal dust for extended periods, are well known and incontrovertible. There may also be severe risks of exposure to lower levels of coal dust. The dust emission from the terminal processing, storage and shipping of coal, can lead to even higher fugitive emissions, approximating those of an open pit coal mine.

- Coal dust can become airborne in particle sizes smaller than 500 microns, with the fraction smaller than 10 microns (PM10) being particularly important, as particles in this size range can be inhaled into the respiratory alveoli. Several health problems can result from respirable coal dust, the most severe of which is Coal Worker’s Pneumoconiosis (CWP), commonly known as **Black Lung Disease**, a progressive, incurable, and often fatal disease.

- Respirable coal dust can also exacerbate asthma and COPD, and cause chronic bronchitis even in non-smoking coal workers, at rates which approximate heavy smokers.

- Studies suggest that pulmonary inflammation and the resultant fibrosis are found over the entire range of exposures. In addition, the synergy of respirable coal dust with other pollutants, such as diesel particulate matter, may accelerate the damage beyond what would be predicted.

- Quite apart from the respirable fraction, however, fugitive coal dust emissions are an undeniable and costly nuisance pollutant to businesses and residences along a rail line, or near a coal terminal, with substantial economic impact simply due to the need for frequent cleaning.
Finally, coal dust in all size fractions contains varying amounts of heavy metal contaminant such as Lead, Mercury, Chromium and at times even Uranium, depending on the origin of coal. Whether this contamination will lead to a substantial health impact deserves further study.

In summary, airborne fugitive coal dust emissions will occur from the transport of coal and these emissions will certainly result in nuisance pollution.

Burning coal releases mercury in a form that settles in water and concentrates in fish. A significant percentage of the mercury found in lake came from coal burned in china. Pregnant women and young children are advised to limit fish intake due to its mercury content which causes:

- Birth defects
- Impaired neurological development

Impact of different sizes of coal particulate is shown below.

**Size of Dust**

- 10-5 µ Upper Respiratory tract
- 5-3 µ Mid respiratory tract
- 3-1 µ Alveoli
Size of Dust Particles

- 10-5 µ: Removed from upper respiratory tract
- 5-3 µ: Deposited in the mid respiratory tract
- 3-1 µ: Deposited directly in the alveoli
- < 1 µ: Move in and out of the alveoli with air,
  - may be deposited in alveolar wall by impaction, or being caught by alveolar movement

Study of Common Pneumoconiosis

Silicosis

Pathological condition of the lung due to inhalation of particulate matter containing free silica or uncombined silica (SiO2) is known as silicosis. Permanent scarring of the lungs is caused by inhaling silica (quartz, SiO2) dust. It is slowly progressive, nodular, fibrosing pneumoconiosis.

Pathology

Fibrotic nodules develop by a particular process in which fibrous tissue is laid down in concentric rings around a central core of silica particles as an onion.

Manifestations

Manifestations include symptoms such as:
- shortness of breath while exercising
- fever
- occasional bluish skin at ear lobes or lips
- fatigue
- loss of appetite

Asbestosis

Asbestosis is the diffuse fibrosis of the lung parenchyma. Asbestos fibers are highly resistant to heat, acids and chemicals are were widely used in industries. Asbestos was banned from use globally since 1973 because it is highly carcinogenic. Asbestosis is characterized by parenchymal lung fibrosis with or without pleural involvement due to inhalation of asbestos fibres. It is more dangerous than silicosis as it predisposes to bronchogenic carcinoma and mesothelioma of the pleura and peritoneum.
Complications

- Bronchogenic carcinoma
- Mesothelioma

5.5 Impacts on sensitive environmental sites

Mangroves and Coal Dust

Mangroves in the Karachi harbour are located at two distinct places viz: Western back waters and Eastern backwaters. Their spread at the former site is significant than the latter. These forests are facing different threats such as expansion of human settlements, untreated sewage from the city, dumping grounds for the solid waste, extraction of woody logs for commercial purposes.

Under this EIA a study was carried out to check the hypothesis that coal dust may affect the growth performance of Avicennia marina the only mangrove species present in Karachi harbour. Following four sites were selected from where leaves were collected from the upper and middle canopy of the trees. The leaves of the lower canopy were not taken as they flushed twice by the tides.

1. Mangroves near Saleh abad
2. Mangroves near to Baba and Bhit island
3. Mangroves near to Chinna Creek
4. Mangroves nursery present at MPCD court yard

The leaves were soaked into the water stirred for ten minutes. The water was checked whether any coal particles/dust found or not. Moreover the cross-section of the leaves were also checked in the microscope to find out whether the coal particles are embedded on the leaf surface.

The finding of these studies revealed that the sand and soil particles found mix in the water but no coal dust was found or traced. This may be due to mangroves present far away from the coal stored area. An observation which supports the findings is that mangroves at all the locations are healthy and no signs of oxygen starvation. Thus there is no adverse impact of coal on mangroves in Karachi Harbour.
Leaves are being collected from the middle canopy  
Mangroves are thriving

5.6 Air Dispersion Modeling

Damage to human health and property caused by coal dust has been discussed above with concern. In fact it is the coal dust which makes the coal handling a difficult and dirty task. The dust of the size of 2.5-10 microns has the tendency to enter any opening which is wider than its own size. It does penetrate through windows and doors even when they are shut i.e. through the joints. Hence it is considered necessary to carry out Air Dispersion Modeling so that movement of dust with the wind in different directions during different parts of the year.

The modeling is based on weather data averages from the thirty years record Pakistan Metrological Department. However any specific wind direction and magnitude can be entered to assess the spread area of coal dust.

Air Dispersion Model for January and February
Air Dispersal Model for July and August

Air Dispersal Model for September and October
5.7 Safety

- You don’t need to be an expert to note that safety has been compromised in most areas of the coal yard. Apparently, this has not been accorded any significance by any of the Yard user.
- Use of PPEs by workers is not visible in any area of Yard. The rep of a major importer explained that we have provided them all requisite items but the workers consider it to be a burden while working.
- The workers were interviewed about the impact of coal on their respiratory but they were found to be least bothered about it. The handsome wages had more attraction for them than their health.
- The trucks and heavy machinery moving on the heaps also take a lot of risk.
• No fire fighting arrangement/ appliances were visible. The coal heaps were so close to each other that in case fire it can be very difficult for the fire tender to reach the spot.
• Similarly there is no consideration of security although the coal if ignited out of terrorism can be extremely dangerous for the adjoining Oil Installation Area.
SECTION 6

MITIGATION MEASURES

6 MITIGATION MEASURES
6.1 Introduction
6.2 Coal Logistics
6.3 Coal stacking yard
6.4 Coal processing at coal yard.
6.5 Guidelines for handling coal.
6.6 Measures under Court’s Orders
6.7 Equipment.
6.8 Dedicated terminal

6.1 Introduction

The following sections outline the mitigation measures against the adverse impacts as identified in Section 5 and also the measures recommended for uplift of the area. The measures also address the safety lapses in the existing coal handling operations. It is expected that these measures, if implemented in letter and spirit, should reduce the adverse impacts to insignificant level. However continuous monitoring is necessary to ensure the sustainability in improvement.

Where the significance of an impact has been undetermined due to lack of critical information/data, mitigation has been included where anticipated impacts are high.

For handling millions of tons of coal a year, the minimization of coal dust is a high priority. A wide range of techniques are used to manage, control and prevent coal dust in and around the coal handling areas including storage, transportation, processing and burning of coal in boilers, etc.

The World Bank’s Recommendations to prevent and control fugitive coal PM emissions include the following:

- Design of the plant or facility layout to facilitate emissions management and to reduce the number of coal transfer points;
• Use of loading and unloading equipment to minimize the height of coal drop to the stockpile;
• Use of water spray systems and/or polymer coatings to reduce the formation of fugitive dust from coal storage (e.g., on stockpiles) as feasible depending on the coal quality requirements;
• Capture of coal dust emissions from crushing / sizing activities and conveying to a bag house filter or other particulate control equipment;
• Use of centrifugal (cyclone) collectors followed by high efficiency venturi aqueous scrubbers for thermal dryers;
• Use of centrifugal (cyclone) collectors followed by fabric filtration for pneumatic coal cleaning equipment;
• Use of enclosed conveyors combined with extraction and filtration equipment on conveyor transfer points; and
• Suppression of dust during coal processing (e.g., crushing, sizing, and drying) and transfer (e.g., conveyor systems) using, for example, ware spraying systems with water collection and subsequent treatment or re-use of the collected water.

Sub-section 6.5 spell out the project specific guidelines which should be adhered to strictly at all stages of coal handling.

6.2 Coal Logistics

The following mitigation plan refers to the action/impact charts drawn for activities related to coal logistics.

Discharge from ship’s hold on to plinth.

<table>
<thead>
<tr>
<th>S.N</th>
<th>Action</th>
<th>Impact</th>
<th>Mitigation measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Grab movement in hold.</td>
<td>Dust emission but mostly contained in the hold. Slight impact on men onboard.</td>
<td>Mist maker or sprayers may be used. This is to be arranged by ship staff.</td>
</tr>
</tbody>
</table>
| 2   | Grab opens at a distance from top of heap on plinth. | Atmosphere gets laden with dust in large volumes. Dust settles in remote areas. Impact on men and infra-structure. | • Penalty may be announced for different mishandling acts including opening of grab above prescribed distance.  
    |                                                    |                                                                        | • Mist maker may be used in the direction heap on plinth.                            |
| 3   | Grab discharges directly in Dumpers. | Emissions comparatively reduced.                                       | Grab opening height should be controlled.                                             |
| 4   | Dropping of cargo in sea between ship & berth | Minute environmental impact. Continuous dropping for prolonged period would require dredging in the area. | Placement of tarpaulin between ship and berth to be ensured before commencement of discharge. |
### Filling up of dumper

<table>
<thead>
<tr>
<th>S.N</th>
<th>Action</th>
<th>Impact</th>
<th>Mitigation measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Dumpers loaded above the above the hatch level.</td>
<td>Cargo spill on way. Impact on men and infrastructure.</td>
<td>Penalty may be announced on overloading.</td>
</tr>
<tr>
<td>3.</td>
<td>Coal covered by Tarpaulin but tied up insufficiently.</td>
<td>Coal spill on road and in atmosphere.</td>
<td>Penalty may be announced on not tying at least 3 points on each side.</td>
</tr>
<tr>
<td>4.</td>
<td>Incomplete water spray on coal prior loading.</td>
<td>Fugitive dust can reach far off places damaging life and property.</td>
<td>Water spray should be made compulsory.</td>
</tr>
</tbody>
</table>

### Dumper movement to coal yard.

<table>
<thead>
<tr>
<th>S.N</th>
<th>Action</th>
<th>Impact</th>
<th>Mitigation measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Dumper tires carrying spilt coal.</td>
<td>Coal spill on road and in atmosphere.</td>
<td>Tire cleaning to be made compulsory prior movement.</td>
</tr>
<tr>
<td>2.</td>
<td>Speeding up of dumpers.</td>
<td>Coal spill and turbulence caused in the coal lying on road causing fugitive dust emission.</td>
<td>Speed limit to be enforced through penalty.</td>
</tr>
<tr>
<td>3.</td>
<td>Dumper’s engine not maintained.</td>
<td>Smoke causing atmospheric pollution.</td>
<td>Dumpers with ill-maintained engines should not be deployed.</td>
</tr>
</tbody>
</table>

### Discharge in coal yard.

<table>
<thead>
<tr>
<th>S.N</th>
<th>Action</th>
<th>Impact</th>
<th>Mitigation measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Indiscriminate dumping of coal.</td>
<td>Aesthetical. Also passage between heaps gets narrowed leaving no space for addressing emergencies.</td>
<td>Area utilization plan to be chalked out and implemented strictly. Sufficient space must be left between heaps for vehicles movement.</td>
</tr>
<tr>
<td>2.</td>
<td>Speedy dumping.</td>
<td>Coal dust emission. Localized but can be carried away by wind.</td>
<td>Drivers to be coercively instructed to ensure gentle movement of bed while dumping.</td>
</tr>
</tbody>
</table>

### Segregation. (In some cases)

<table>
<thead>
<tr>
<th>Action</th>
<th>Impact</th>
<th>Mitigation measures</th>
</tr>
</thead>
</table>
### Meticulous Management of Coal Handling

<table>
<thead>
<tr>
<th>S.N</th>
<th>Action</th>
<th>Impact</th>
<th>Mitigation measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Uncovered operation.</td>
<td>Massive dust emission. Gets carried away by wind to remote areas.</td>
<td>Uncovered segregation should be strictly prohibited.</td>
</tr>
<tr>
<td>2</td>
<td>Dropping of coal on vibrating screens from top of the heap.</td>
<td>................do.................... ....................</td>
<td>Dropping from top should be strictly prohibited.</td>
</tr>
<tr>
<td>3</td>
<td>Separated dust not handled with care.</td>
<td>As the dust is dry it has more potential to fly off even with slight breeze.</td>
<td>Separated dust to be bagged and handled within fenced premises.</td>
</tr>
</tbody>
</table>

### Filling up of railway wagons and trucks.

<table>
<thead>
<tr>
<th>S.N</th>
<th>Action</th>
<th>Impact</th>
<th>Mitigation measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Loading above hatch level.</td>
<td>Can cause coal spillage and dust emission all over the way till destination.</td>
<td>Above hatch level loading should be prohibited.</td>
</tr>
<tr>
<td>2</td>
<td>Insufficient securing of Tarpaulin.</td>
<td>................do.................... ....................</td>
<td>Truck should not be allowed to move out if not tied at at least 3 points on each side.</td>
</tr>
</tbody>
</table>

### Coal yard management.

<table>
<thead>
<tr>
<th>S.N</th>
<th>Action</th>
<th>Impact</th>
<th>Mitigation measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Congestion in coal yard.</td>
<td>More pollution, aesthetically unpleasant and operational difficulties. Also difficult to address emergencies. No room for firefighting.</td>
<td>Strict policy to be adopted for timely removal of coal from coal yards. Importers should not be allowed to use the place as their storage space for prolonged time, waiting for customer,</td>
</tr>
<tr>
<td>2</td>
<td>Wetting of pathways.</td>
<td>Aesthetical and operational issues.</td>
<td>Water may be modestly sprayed instead of pouring it on the pathways,</td>
</tr>
<tr>
<td>3</td>
<td>Injection of water in coal to increase moisture.</td>
<td>................do.................... ....................</td>
<td>Water should be sprayed on top surface scrupulously.</td>
</tr>
<tr>
<td>4</td>
<td>Excessive peak height of the heaps due humungous quantum of coal.</td>
<td>Vast spread of coal dust and also safety risks for trucks and other machinery working on top.</td>
<td>Heap height to be kept within that prescribed in coal policy.</td>
</tr>
</tbody>
</table>
5 Breached boundary wall | Security risk | Security must be beefed up and extra openings in the boundary wall must be closed.

6 Workers not using PPEs | Safety and health risks | Use of PPEs should be a condition on hiring the worker.

7 No fire-fighting equipment/arrangement could be seen. | Serious safety concern | Equipment and training must be provided to workers. Also periodical exercise to be conducted.

8 Rain/wash water direct drain into sea. | Rainwater runoff from coal stockpile may be acidic due to oxidation of pyrite into sulphuric acid. Not a serious concern for marine environment. | Proper drainage system to provided. Large sized drain tank to be made for collection of coal wash

6.3 Coal stacking yard

6.3.1 Existing status

The existing environmental status of the coal stacking yard can be termed as unsatisfactory rather hopeless just because of negligence exhibited by the users and certain genuine constraints. The avoidance to spray fine droplets of water on top of the heap and instead forcing water jet on bottom of the heap has double adverse impact. Similarly the poor housekeeping and maintaining muddy pathways through heedless dropping of water, all account for negligence. Lack of space for stacking of coal resulting in high rise heaps can be termed constraint but in a way this act also for heedless attitude of the yard users. This has been studied that all above and many other lapses can be addressed through proper maintenance and adherence to the guidelines and recommendations contained in this report.

The pollution cycle can be reversed with will, efforts and perseverance.

Uplift of infra-structure, provision of coal dust suppressant, control on coal retention in yard and similar other measures can be very fruitful. As has been mentioned earlier the biggest emitter of coal dust are the segregating equipment which being used in an absolutely negligent manner. The use of these arrangements, open to atmosphere should be strictly prohibited.

Arrangement should be made to keep the entire atmosphere of the yard laden with fine mist through mist makers.

Presently there is no drainage system for rain wash of the coal. This should be arranged that drainage of entire yard is channeled to a waste water collection which can further be processed for draining into without any ill-effect.
6.3.2 **Storage at coal yard**

The coal storage in the yard is normally either short term or long term. As per the recommended policy long term storage should not be allowed except for some genuine reason of extreme significance. In such situation higher storage charges are to be prescribed and applied.

During storage it should be the responsibility of the Stevedore/Importer to regularly suppress the dust emission either through water spray or some other means. Spray of Polymers or other stabilizing compound may be considered for long term storage. Injection of water jet in the coal heap to raise the moisture content should not be allowed.

6.3.3 **Land acquisition for surplus stock**

There is a cargo space limitation in the existing yard. Presently this limitation is being overcome by raising the heap height to dangerous and environmentally damaging level. It is imperative that if the present quantum of coal inflow is imminent then KPT should arrange for extra land for storage and the height of the heaps in existing yard must be reduced at the earliest.

6.3.4 **Fencing of coal yard by fixing screens**

As discussed later in this section the Hon’ble High Court has ordered for installation of green net screen on the existing boundary wall of the yard, which KPT has done. In this regard it is to note that the 5 ft. high net on the existing boundary wall of around 9 ft will not serve the purpose if the height of the heaps is not brought down to 5 mtrs as recommended in the guidelines.
6.3.5 **Methods of stacking (Proposed for the Mechanized dedicated coal Terminal)**

Generally the following methods are used for stacking of coal in the form of heaps.

1. **Windrow Method**
   In this method, the stacker moving on rails spills the coal in parallel rows along the Yard’s length. As shown in Figure below. The stacker performs the operation by traveling forth and back along the stacking area and beginning to spill the first rows then the second, third rows and so on. A very good blend can be obtained when the coal is taken by a reclaimer from the stack formed with this method. Disadvantage of this method is collection of rain water between the coal rows and penetration in the stack as a result of long lasting and continuous rainfall.

2. **Chevron Method**
   In Chevron Method, the stacker moves along the storage area on an axis which divides the area in equal parcels and spills the coal in triangular prism-shaped stacks. As shown in the Figure below, the stacking operation is first performed along the first prism. The machine spills the second layer on its way back and continues the same operation until the desired final stack height is reached.

   When this method is used, the rain water flows down on the slopes of the stacked coal. In summer time, since the surface area exposed to the hot air is larger, drying effect becomes more significant.

   In addition, the rock particles not picked out in the production process, roll down on the slopes during stacking and consequently separated from the coal.

3. **Cone Shell Type Method**
   In Cone Shell Type Method, the stacker spills the coal in cone shape until the final stack height is reached. As shown in Figure below, the stacker begins to spill the first cone, then moves one step forward to spill the second cone until the stack height and continues the operation step by step.

   This method can be applied in areas where long and rigorous winter conditions prevail in order to ensure that stacked coal is affected by rain water at minimum level. In case Windrow and/or Chevron methods among the ones briefly explained above are used for storage, a very good blend is obtained when the coal is taken from the stack by a reclaimer. For an optimum blend, the reclaimer has to work perpendicularly to the long axis of the stack. To adjust the calorific value of the blend, high calorific valued coal can be added during the stacking operation.
6.4 Coal processing at coal yard

The coal processing at the yard should be treated as an industrial activity which should not be allowed considering the scarcity of the land. The processing mainly refers to mechanized segregation of coal dust. The segregation results in heavy coal dust emissions. It is recommended that if segregation is imminent it may only be allowed in a separate portion of the yard, dedicated for the purpose in total adherence to the guidelines in this context. The machinery should be well maintained and the separated dust to be bagged instead of carrying in bulk.

6.5 Proposed Guidelines for handling coal.

**Following guidelines are proposed for handling of coal.**

(A) Yard location

1. Coal storage land should be located at a minimum distance of 250 meters away from the agriculture or green land.
2. Coal storage land shall be minimum 500 meters away from the residential area, school or colleges, Historical Monuments, Religious Places, Ecological sensitive area as well as forests area.
3. Coal storage land shall be located at a minimum 500 meters away from the water bodies like River, Nalah, Canal, Pond etc.
4. In case of coal handling activities at the berths the distance and land use criteria may be relaxed and compensated by advanced/sophisticated pollution control measures and mechanization, however all such berths where coal handling is carried out, shall provide closed mechanization for handling of coal.

(B) Storage and handling

5. Coal to be stored coal in such a way that coal heap should not be higher than 5 meter and clear distance between two adjoining heaps at ground level should be 5 meters, so that in case of fire, approach is available.
6. There should be mechanized loading/unloading system from the loading/unloading area to the stacking yards and in to the vehicles.
7. Coal handling Agency shall take all corrective steps to resolve the issue of air pollution at permitted coal storage/handling area where coal is being stored.
8. Equipment for suppression of dust to be installed by the user, supported by KPT in terms of provision of space, power supply, etc.

(C) Transport

9. Coal handling Agency shall ensure that all trucks before leaving the storage yard shall be showered with water with adequate system, shall be covered with tarpaulin or any other effective measure/device completely and also that trucks are not over loaded as well as there is no spillage during transportation.
10. The vehicle carrying the coal should not be overloaded by raising the height of carriage. Weigh scale shall be provided within the loading area only and KPT shall ensure that no overloading is done.
11. Coal handling unit/Agency shall obtain transport permission from the local Administration under the relevant rules.

(D) Pollution prevention

12. KPT shall provide clear pathways with adequate space for 2-ways traffic.
13. KPT shall complete the boundary wall all along periphery of the premises with a minimum 9 meters total height i.e brick wall plus fence.
14. Continuous water sprinkling or mist forming shall be carried out on the top of the heap at regular intervals to prevent dusting, fire & smoke.
To prevent fugitive emission during loading/unloading, fixed pipe network with sufficient water storage and pump shall be installed. Water sprinkling shall be carried out at each and every stage of handling to avoid generation of coal dust or other dust within premises.

15. Coal handling Agency shall ensure regular sweeping of coal dust from all roads used by their trucks and also ensure that there is adequate space for free movement of vehicles.

16. The following adequate Air Pollution Control Measures shall be installed and to be operated efficiently.
(a) Dust containment cum suppression system for the coal stack, loading and unloading.
(b) Construction of effective wind breaking wall suitable to local condition to prevent the suspension of particles from the heaps.
(c) Construction of metal road & RCC Pucca flooring in the stacking area.
(d) System for regular cleaning and light wetting of the floor area within the premises.

17. KPT with the co-operation of Coal handling Agency shall carryout plantation with tall growing tress all along the periphery of the coal handling premises, inside & outside of the premises along with road.

18. Proper drainage system shall be provided in all coal storage area so that water drained from sprinkling & runoff is collected at a common tank and can be reused after screening through the coal slit or any other effective treatment system.

19. All the engineering control measures including covered conveyer belts, mechanized loading and unloading, etc. shall be provided in addition to the measures recommended for curbing the pollution.

(E) Safety requirement

20. KPT in cooperation with Coal handling Agency shall provide adequate fire fighting measures to avoid any fire or related hazards including adequate water storage facility.

21. An onsite emergency plan shall be prepared and implemented by KPT and coal handling Agency.

(F) Legal
22. Necessary permission from all the applicable regulatory authorities and adequate steps under the provisions of Pakistan Environmental Protection Act 1997 shall be taken.
23. KPT and Coal handling Agency shall adhere to the provisions of EMP (Environment Management Plan) and implement the same in true spirit and thus maintain overall environment of that area.
24. Coal handling Agency shall not carry out the operation of loading/unloading of coal/coal dust at any place till adequate air pollution control equipment for dust control/suppression are installed and efficiently operated.
25. KPT/Coal handling Agency shall operate regular Ambient Air Quality Monitoring particularly for PM$_{2.5}$ and PM$_{10}$ on monthly basis.

6.6 Measures under Court Orders.

The Hon'ble High Court of Sindh has issued orders to take certain measures on immediate, short term and long term basis.

IMMEDIATE MEASURES

Component ‘A’ of the project inter-alia includes the following instructions of the Hon'ble High Court for immediate action by the KPT and Stevedores.

v. ENVIRONMENTAL IMPACT ASSESSMENT STUDY ON COAL HANDLING
vi. PROVISION OF WIND BREAKERS ON THE BOUNDARY WALL
vii. SPRAYING ON THE COAL HEAPS
viii. REDUCING OF THE COAL STACK AT THE YARD FROM 750,000 M.TONS TO 300,000 M.TONS WITHIN 30 DAYS

Compliance

a) ENVIRONMENTAL IMPACT ASSESSMENT STUDY ON COAL HANDLING

The Hon'ble High Court issued directions to carry out EIA Study through Independent consultant on handling Coal. The study should propose Environment Management Plan for handling of the Coal at Port. Safety mitigations should also be part of the study. The study should be completed in 30 days and submitted to EPA Sindh for approval. KPT will do mitigations measures after approval of the study at Port Trust.

Action: The EIA consultancy has been awarded to Enviro-Maritime Capacity Building Institute. Work is in progress at a satisfactory pace.
b) PROVISION OF WIND BREAKERS:
Hon’ble Hight Court Orders that wind breakers on the boundaries facing towards the human settlement areas is to be fenced on the boundary wall with the wind breakers wall such as putting GREEN NET. The left-over boundary wall parallel to the Coal Yard is to be established.

Action: This has been completed to a great extent, as apparent from the photographs.

c) SPRAYING ON THE COAL HEAPS
Hon’ble High Court also ordered for continuous spraying on the coal heaps. The Coal heaps need to be sprayed by the seawater regularly through developing mechanized spray system by the CM&EE Department. However, in the meantime Traffic and MPCD Departments will emphasized to Coal handlers to spray continuously on the heaps to control the coal dust which in practice.

Action: Manual spraying is in progress and mechanized spray system is being suggested in this study.

d) REDUCING OF THE COAL STACK AT THE YARD FROM 750,000 M.TONS TO 300,000 M.TONS WITHIN 30 DAYS

Hon’ble High Court ordered that Coal heaps / stacks at Coal Yard may be reduced from 750,000 M.Tons to 300,000 M.Tons to further arrest the Coal dust etc. Though the KPT Legal Advisor and Traffic Manager strongly stressed, it is beyond the control of KPT, however, the Hon’ble Court directed for the exercise.

Action: Through following letters the Traffic Manager, KPT asked:
   i. Stevedores to clear the cargo from coal yard.
   ii. Asst. T.M. to comply with Courts instructions in letter and spirit.
M/s. ……………………….
Stevedores (Pvt) Ltd,
Karachi

SUBJECT: NON CLEARANCE OF HUGE QUANTITY OF COAL (748,641 M/TONS) LYING AT KPT COAL YARD

Dear Sirs,

1. Due to increased volume of Coal, lying un-cleared at Coal Yard i.e. 748,641 M/ tons of 22 vessels of different consignees, the KPT is facing serious difficulties to provide space for the expected coal vessels, therefore, the unprecedented dumped coal consignments required clearance at earliest and without further loss of time.

2. The Shipping Agents, Coal Handlers / Stevedores and the Importers / Consignees are informed through this letter that to ensure the uninterrupted services of KPT regarding handling of coal vessels at KPT the prompt action is required i.e. clearance of coal through Railway and Road transport within short span of time to match the very slow clearance pace with the unloading speed of cargo.

3. To overcome the space problem, the efforts by Consignees and Coal Handlers are urgently required on war footing basis for which the KPT has repeatedly highlighted the challenge to all concerned. The present position is badly affecting the Coal operations and the stakeholder i.e. Shipping Agent, Stevedores and Consignees suffering are obvious because of non-clearance of coal despite elapse of months together.

4. In the light of above, and for attaining the smooth handling of Coal it is advised that all concerned may initiate the engagement of transport / railways for clearance of landed / dumped coal consignments from port premises and the Karachi Port will anxiously wait for the desired level of action on priority basis.

Yours truly,

TRAFFIC MANAGER

KPT letter No.2
KARACHI PORT TRUST
(TRAFFIC DEPARTMENT)

ASSTT: TRAFFIC MANAGER (KGCC)
TRAFFIC OFFICER (COAL YARD)
INCHARGE (COAL YARD)

SUBJECT: CONST. PETITION NO. D-5130 /2014, ASHFAQ QURESHI & OTHERS V/S. KPT, SINDH ENVIRONMENTAL PROTECTION AGENCY & OTHERS, IN THE HIGH COURT OF SINDH, AT KARACHI ON COAL.

REF’NCE: A. M/s. Badar Alam & Company, Advocate of Supreme /
High Court of Pakistan, Legal Advisor KPT’s letter No. BA/KPT/660 dated 20-11-2014.
C. Presentation on Coal handling progress report in the Ops. meeting dated 25-11-2014 and instructions thereof.
D. GM(O)’s letter No. T/ATM(P)/Coal/126/14/263 dated 26-11-2014 ______

1. To meet the targets in compliance of Honourable High Court Orders, number of actions is under implementation in various departments / offices apart from through private stakeholders i.e. Consignees / Importers, Shipping Agents, Stevedores and others which required constant and effective coordination by the Officers / Official Incharges of Coal Yard as the implementation is being done at the Coal Yard / site.

2. With the above background, henceforth, a Monitoring / Coordination Cell has been established in the office of ATM (KGCC/Coal Yard) and it is directed that the progress be monitored on day to day basis and the needful be done on priority basis to ensure compliance of Honourable High Court Orders as briefed from time to time.

3. Apart from others, the following may be ensured:
The 2nd last para of High Court Orders dated 17-11-2014 from ‘a’ to ‘e’ may be effectively chased with reference to General Manager (Ops) letter dated 26-11-2014.
The Auction “B Form” presented to Customs may be pursued.
The Shipping Agents, Stevedores / Plot Holders and Consignees may be informally and formally be asked to expedite the clearance to attain the target of Coal up to 300,000 M/Ton at Coal Yard instead of existing high tonnage.
Apart from clearance other issues may be watched on daily basis through concerned staff and a progress report be submitted accordingly.
The Legal Advisor KPT be kept in loop and once a day the development / progress be reported for having proper guidelines to proceed further being subjudice matter.
The MPCD / PSF Department be also coordinated as per spirit of the judgment.
The liaison be made regularly with both the ATMs of Wharf to have proper / smooth working as discussed and minuted after various meetings.
Traffic Manager.

Actions taken on above letters resulted in reduction of coal in the yard to around 500000 tons by 20th Dec. as shown in sub-section 3.2.

SHORT TERM MEASURES:

- Short Term Measures As highlighted under heading Constitution Petition No.D-5130/2014 on coal Pollution.
- Tarpaulin cover on dumpers / delivery trucks.
- No dumping on wharf while discharging coal.
- Speed of dumpers to be controlled.
- Road from wharf to Coal Yard be cleaned further.
- Tarpaulin b/w wharf and vessel.
- Loading of trucks upto hatch level.
- Grabs to be opened quite near to dumper at wharf.
Action: The above measures are being complied but there is room for improvement as the workers tend to deviate from the requirement in the absence of regular monitoring.

**LONG TERM MEASURES:**

- Dedicated coal berth.
- Conveyor belt from vessel Coal Storage Area.
- Dome to control the pollution.
- Railway facility through Pakistan Railways.
- Dedicated railway line from KPT to Pipri.
- Development Coal Yard with engineering based pollution control facilities.

Action: The measures are to be communicated to the Consulting firm upon appointment.

6.7 Equipment.

As mentioned in Section 3.5 a number equipment are in use at the yard some for processing the coal, others for spraying water and maintenance of heaps, etc.

As mentioned above the processing in terms of segregation of coal dust is not supported in open areas. Comments are as follows.

6.7.1 **Water spray systems**

The coal dust control technologies mostly use powerful water spray or mist producing machine for suppression of dust.

As per SoPs in KPT it is required that water is sprayed on coals at different handling points and on the heaps in the coal yard.

The spray is done through an standard nozzle and hose periodically to maintain wetness during cargo discharge at berths and loading on trucks.

In 2009 a high pole mounted sprinkler was installed in the yard as a test for installation of 8 similar sprinklers covering the entire yard. Ground water was made available to the electrically driven pump for spraying at a height of about 15 mtrs. Apparently the project did not survive due to lack of will to overcome the teething issues.

It is strongly recommended that a robust system for spraying water through high pole mounted sprayers may be installed and maintained properly. The pole should be so
located that the entire yard is covered by the spray or mist. It is important that such system should be installed and maintained by competent technicians or else the system would meet the same fate as the 2009 test case and abandoned.

There are very powerful and effective mist makers available, built purposely for suppressing coal dust. The coal handling Agencies should each procure and use such units for use at different points.

The provision of fresh water for spraying and mist formation can arranged jointly by KPT and the handling Agencies.

6.7.2 Segregating equipment

Vibrating Screen

The Vibrating Screen are used to separate materials into various sizes for further processing. The vibrating screens are used in coal and other such material carrying dust.

In KPT’s coal yard these have proven to be a big nuisance and even the workers who were interviewed regarded these plants to be the cause of the hue and cry made recently against the coal handling. This is particularly because of negligent handling of the equipment.

Use of these equipment may either be banned or confined to some covered section of the yard from where the dust emission remains under control. Also the segregated dust should be bagged and not handled in bulk.

6.7.3 Heavy machinery

The heavy machinery deployed for streamlining the coal heaps is required to be maintained as their engines emit substantial smoke adding up to the coal dust blackness in the atmosphere and creating health issues for the workers. These machines also work on top of the heaps creating safety issues. The noise issues are also a point of concern.

6.7.4 Dumpers, trucks, etc

Dumpers are used for transportation from ship to coal yard. Trucks of different sizes including 16 wheelers carry the coal from coal yard to final destination. Besides their own emissions their negligent/heedless handling can cause severe pollution on land and atmosphere.
Their engines should be well maintained to avoid smoke and noise emission issues.

6.8 Dedicated Terminal

KPT has been well aware of the need of a dedicated mechanized coal terminal ever since the coal import has taken new dimensions. Initially the coal terminal was included in KPT’s mega project of Cargo Village. As the Cargo Village project has been delayed due to certain constraints KPT has considered certain other locations including the existing coal yard for setting up a modern dedicated coal terminal. KPT has already invited Consultancy Offers from reputable firms for the purpose. The advertisement inviting proposals appeared in the leading Dailies much before the petition mentioned in Section 3.0 above was filed in the high court.

- As planned, a new dedicated coal terminal will be constructed, likely at 2 berths in PDWCP, with a starting capacity of 12.8 million tons, and further increases to over 20 million tons in year 2025 after deepening of PDWCP to 18m draft levels. Hence, Karachi port will offer sufficient capacity to handle the forecasted coal volumes assuming the new dedicated coal terminal will be developed in the short term future.

- In case the dedicated coal terminal will not be developed within PDWCP, berth 14 - 17 may be redeveloped as a specialized and dedicated coal facility (also capacity of 12.7 million ton), with a high level conveyor belt to the bonded coal stack area at timber pond and road/rail connection to main railway network and city roads.

6.8.1 EHS measures at the Dedicated Terminal

The Project Consultants would be advised about the EHS considerations in the planning of the terminal. In fact the entire EIA report is to be handed over to them. However as the new terminal would be a mechanized terminal there would be many other terminal specific EHS considerations and those would need to be incorporated in the EIA of the new terminal.

The dedicated terminal will also have two number berths on which the Port Pollution Control regime would apply. The ships would be inspected in the light of International conventions MARPOL 73/78. For this purpose the KPT’s environmental Policy and ship inspection policy, as annexed with this report may be referred.
SECTION 7

ENVIRONMENTAL
7.1 Environmental Management Plan

An Environmental Management Plan (EMP) is necessary to effectively implement and manage the proposed mitigation measures. It provides a delivery mechanism to address the potential impacts of the project activities, and to develop a monitoring program in order to minimize the potential impacts during the construction and operational phases of the project.

A separate regime has been proposed for monitoring the adoption of the mitigation measures. One of the aims of the monitoring program is to actually observe and analyze the project’s impacts, thereby providing the information to help in the design of mitigation measures to reduce the risks associated with the project. The EMP, one of the outcomes of the EIA, identifies key areas requiring attention during the project, in particular,

- What is to be managed and monitored?
- When and where;
- By whom;
- The expected cost for management; and
• Who to report and follow up if there is an issue that may arise at any phase of the project.

7.1.1 **Objectives of the Environmental Management Plan**

The primary objectives of the EMP are to:

• Use the mitigation measures outlined in the EIA to define the responsibility and timing for the implementation of these measures;
• Develop a monitoring mechanism and identify parameters that can confirm the implementation of the mitigation measures;
• Define the roles and responsibilities of the project proponent, the KPT and the Coal Handling Agencies for the implementation of EMP and identify areas where these roles and responsibilities can be shared with other stakeholders;
• Define the requirements necessary for documenting compliances with the EMP and communicating it to all concerned regulatory agencies; and
• Develop a Training Programme to ensure all actions can be undertaken adequately.

7.2 **Roles & Responsibilities**

For the purpose of project implementation, the Coal Handling Agencies, under the monitoring regime of KPT will be the sole responsible organization for the implementation of the EMP. However the overall responsibility for the implementation of the EMP will be with KPT.

All other stakeholders and players would however be required to follow the Environmental guidelines provided by the KPT from time to time. The general roles and responsibilities of KPT and the Coal Handling Agencies are proposed in the following sections.

7.2.1 **KPT**
As project proponent, KPT will be responsible for ensuring the EMP is implemented by the Coal Handling Agencies during the cargo operations in letter and spirit.

The Traffic Manager of the KPT will be responsible for overall projectargo operation.
The Marine Pollution Control Department of KPT will liaise with the Coal Handling Agencies and will be responsible for ensuring that all environmental obligations related to cargo operations, as well as environmental and social compliances are met according to the requirements mentioned in the EIA. KPT will then be responsible for the implementation of mitigation measures during the cargo operation once the Coal Handling Agencies’ duties are fulfilled.

7.2.2 The Coal Handling Agencies

The Coal Handling Agency handling the coal cargo will be responsible for implementation of, and adherence to, the provisions of the EIA relevant to their respective areas. Overall responsibility for the Coal Handling Agencies environmental compliance will rest with the person holding the highest management position within the Coal Handling Agencies organization. The Coal Handling Agency’s Project Manager will be responsible for the effective implementation of the EIA and the EMP. Each Coal Handling Agency will designate a Health, Safety and Environment (HSE) person who will bear the responsibility to ensure implementation of or adherence to the requirements of the EMP.

7.2.3 The Supervision Consultant

As per provision of EIA rules the KPT may appoint an independent EIA consultant who will oversee that the ongoing activities related to handling of coal are in consonance with the provisions of the EIA. He shall be responsible for the preparation of monthly reports on the project progress. The consultant will maintain records of all activities mentioned in Mitigation Plan as implemented by the respective Coal Handling Agency. The consultant will assist the KPT or the Coal Handling Agencies in preparing progress report in implementation of the EIA.

7.2.4 Project Design
In the case of Construction of a dedicated coal terminal the approval of the EIA will be obtained by the KPT after which KPT will finalize the design of the project.

### 7.2.5 EIA Provisions

Adherence to the requirements of the EIA and EMP in terms of environmental compliance and implementation of mitigation measures will be an essential requirement from all Coal Handling Agencies. Therefore, the EMP will form part of the Agreement that may conclude to coal handling operations between the KPT and the Coal Handling Agencies.

### 7.3 Execution of the Project

#### 7.3.1 Co-ordination with Stakeholders

The KPT will ensure that co-ordination required with the coal handling stakeholders on environmental and social matters as required by the EMP is maintained on regular basis.

#### 7.3.2 Environmental Management System

The KPT and the Coal Handling Agencies will ensure that the mitigation measures mentioned in the EIA are adhered to and Health, Safety and Environment (HSE) protocols are implemented during the execution of the project. The contractor(s) will abide by the relevant Agreement provisions relating to the environmental management of physical, biological and socio-economic and cultural environment.

#### 7.3.3 Monitoring

The KPT's EIA consultant will ensure that the project activities are monitored according to the environmental monitoring programme prescribed in the EMP. The KPT will nominate an Environmental officer to coordinate and ensure the compliance of mitigation measures recommended in the EIA.

#### 7.3.4 Training
The KPT and its Coal Handling Agencies will be responsible for providing training to the coal handling staff members on the EIA, EMP and the implementation requirements provided in the EMP.

7.3.5 Communication and Documentation

The KPT will ensure, through its EIA Consultant that the communication and documentation requirements specified in the EMP are fulfilled during the operation.

7.3.6 EMP Implementation

The two phases of the project i.e. existing coal handling construction of dedicated coal terminal would be considered separately for the EMP. However, it is possible that during the two phases some aspects of the EMP will need to be changed owing to their non-applicability in a certain area of operation or the need for additional mitigation measures based on the findings of environmental monitoring during the construction and operation phase.

7.3.7 Management Teams

Following structure of the Environmental Management team has been considered appropriate.

Monitoring of Environmental Management would be done independently by the EIA Consultant.

Overall Supervision
(Mgr MPCD)

Team Members
KPT
Pollution Control Officer
Traffic Officer(Coal)

Coal Handling Agency
On-site Official
Equipment Technician
Labor (Agency)

**Monitoring Officer**
(EIA Consultants)

### 7.3.9 Implementation of EMP

A senior staff member of the Coal Handling Agency would be nominated as the focal person for all aspects related to pollution prevention and environmental uplift activities.

The implementation of the EMP would however be overseen by the KPT's EIA Consultant.

The EMP covers most of the environmental aspects which are to be addressed. Aspects which need consideration are mentioned in mitigation plan (Section 6) and Recommendations (Section 8). Topics for ready reference are charted out on next page.

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Activity</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal Dust Emission</td>
<td>Water spray during discharging from ship, retention at yard and dispatch to user.</td>
<td>Coal Handling Agency (CHA)</td>
</tr>
<tr>
<td></td>
<td>Water spray equipment maintenance</td>
<td>CHA</td>
</tr>
<tr>
<td></td>
<td>Segregating arrangement (Permission)</td>
<td>KPT</td>
</tr>
<tr>
<td></td>
<td>Height of boundary wall/fence</td>
<td>KPT</td>
</tr>
<tr>
<td></td>
<td>Monitoring of air quality-particulate matter</td>
<td>CHA</td>
</tr>
<tr>
<td></td>
<td>Installation of Portable mist maker on berth</td>
<td>CHA</td>
</tr>
<tr>
<td></td>
<td>Excessive water causing muddy pathways.</td>
<td>CHA</td>
</tr>
<tr>
<td>Water drainage</td>
<td>Drainage of water (rain or otherwise)</td>
<td>CHA/KPT</td>
</tr>
<tr>
<td>Grab discharge</td>
<td>Grab movement in hold.</td>
<td>Ship staff</td>
</tr>
<tr>
<td></td>
<td>Grab opens at a distance from top of heap on plinth.</td>
<td>CHA</td>
</tr>
<tr>
<td>Meticulous Management of Coal Handling</td>
<td></td>
<td></td>
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<tr>
<td>----------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Grab discharges directly in Dumpers.</strong></td>
<td>CHA</td>
<td></td>
</tr>
<tr>
<td><strong>Dropping of cargo in sea between ship &amp; berth</strong></td>
<td>CHA</td>
<td></td>
</tr>
<tr>
<td><strong>Atmosphere gets laden with dust in large volumes. Impact on men.</strong></td>
<td>CHA</td>
<td></td>
</tr>
<tr>
<td><strong>Dumper movement</strong></td>
<td>Cargo spill on way. Impact on men and infra-structure.</td>
<td>CHA</td>
</tr>
<tr>
<td></td>
<td>Coal spill on road and in atmosphere.</td>
<td>CHA</td>
</tr>
<tr>
<td></td>
<td>Fugitive dust can reach far off places damaging life and property.</td>
<td>CHA/KPT</td>
</tr>
<tr>
<td></td>
<td>Coal spill on road and in atmosphere.</td>
<td>CHA</td>
</tr>
<tr>
<td><strong>Dumper speed</strong></td>
<td></td>
<td>CHA</td>
</tr>
<tr>
<td>Dumper tires carrying spilt coal.</td>
<td>Coal spill on road and in atmosphere.</td>
<td>CHA</td>
</tr>
<tr>
<td>Speeding up of dumpers.</td>
<td>Coal spill and turbulence caused in the coal lying on road causing fugitive dust emission.</td>
<td>CHA</td>
</tr>
<tr>
<td>Dumper’s engine not maintained.</td>
<td>Smoke causing atmospheric pollution.</td>
<td>CHA</td>
</tr>
<tr>
<td>Indiscriminate dumping of coal.</td>
<td>Aesthetical. Also passage between heaps gets narrowed leaving no space for addressing emergencies.</td>
<td>CHA/KPT</td>
</tr>
<tr>
<td>Speedy dumping.</td>
<td>Coal dust emission. Localized but can be carried away by wind.</td>
<td>CHA</td>
</tr>
<tr>
<td>Uncovered operation. (Segregation)</td>
<td>Massive dust emission. Gets carried away by wind to remote areas.</td>
<td>CHA/KPT</td>
</tr>
<tr>
<td>Dropping of coal on vibrating screens from top of the</td>
<td>...........do..................................</td>
<td>CHA/KPT</td>
</tr>
<tr>
<td>Issue</td>
<td>Description</td>
<td>Agency</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Separated dust not handled with care.</td>
<td>As the dust is dry it has more potential to fly off even with slight breeze.</td>
<td>CHA/KPT</td>
</tr>
<tr>
<td>Loading above hatch level.</td>
<td>Can cause coal spillage and dust emission all over the way till destination.</td>
<td>CHA</td>
</tr>
<tr>
<td>Insufficient securing of Tarpaulin.</td>
<td>..........................................................</td>
<td>CHA</td>
</tr>
<tr>
<td>Congestion in coal yard.</td>
<td>More pollution, aesthetically unpleasant and operational difficulties. Also difficult to address emergencies. No room for firefighting.</td>
<td>KPT</td>
</tr>
<tr>
<td>Wetting of pathways.</td>
<td>Aesthetical and operational issues.</td>
<td>CHA/KPT</td>
</tr>
<tr>
<td>Injection of water in coal to increase moisture.</td>
<td>..........................................................</td>
<td>CHA</td>
</tr>
<tr>
<td>Excessive peak height of the heaps due humungous quantum of coal.</td>
<td>Vast spread of coal dust and also safety risks for trucks and other machinery working on top.</td>
<td>KPT</td>
</tr>
<tr>
<td>Breached boundary wall</td>
<td>Security risk.</td>
<td>KPT</td>
</tr>
<tr>
<td>Workers not using PPEs</td>
<td>Safety and health risks.</td>
<td>CHA/KPT</td>
</tr>
<tr>
<td>No firefighting equipment/arrangement</td>
<td>Serious safety concern.</td>
<td>KPT/CHA</td>
</tr>
</tbody>
</table>
Rain/wash water direct drain into sea. | Rainwater runoff from coal stockpile may be acidic due to oxidation of pyrite into sulphuric acid. Not a serious concern for marine env’t. | KPT

**Monitoring**

It would be the responsibility of concerned departments such as Traffic, PSF and MPCD to ensure that the above management plan is implemented in their respective areas of responsibility in letter and spirit. In addition the following provisions are also to be taken care of as explained.

**Environmental Uplift**

The KPT and CHA would participate in environmental uplift activities such as plantation of trees on both sides of the boundary wall to compensate for the aesthetical depreciation caused due to project activities. The tree should be coal dust resistant.

**Safety**

Although safety is integral to this EIA the requirements to cover safety risks for men and material are to be met as per safety manual of KPT.

**Socio-economic**

Due regard would be paid to the socio-economic requirement of the workers. Their working hours would be in suitable proportion to their free and rest hours.

Provision of medical facility may be optional but first aid requirements and treatment of accidental injuries is mandatory.
Provision of a canteen where tea and meals are available at subsidised rates is also to be ensured.

Wash room facility and prayers place should also be provided. Maximum job opportunity would be provided to the inhabitants of the nearby localities such as Keamari town, Shireen Jinnah Colony, Sikandarabad etc.

**CSR**

Coal Handling Agencies to be persuaded to exhibit Corporate Social Responsibility towards nearby localities.

**SECTION 8**

8 CONCLUSION & RECOMMENDATIONS
8.1 General comments.
8.2 Recommendations for Administrative & Operational Aspects.
8.3 Recommendations for Infra-structure
8.4 Recommendations for Equipment.

8.1 General comments.

The Project on ‘Meticulous management of handling of coal at Karachi Port’ has been examined thoroughly in the context of Environment, Health and Safety.

The existing practices of handling of coal were found to have some lapses/negligence which resulted in environmental degradation. However after conduct of this EIA it is deemed that with some efforts on the part of all Stakeholders the Pollution cycle can be reversed and work can continue in the same area till construction of a Dedicated Mechanized Coal Terminal if the provisions of this EIA are given due consideration and implemented in Letter and Spirit.
During Interviews it was apparent that all concerned want that the Environmental conditions at the coal yard be improved they lacked initiative and have surrendered to the gradual depreciation of the area.

Some recommendations are being made so that the uplift process is commenced with confidence and due diligence.

8.2 Recommendations for Administrative & Operational Aspects.

It is strongly recommended that KPT should chalk out a firm and viable Policy on handling of coal in the Port and Coal Yard. The Policy should spell out the quantum of coal which can be discharged in the Port and the duration for it can be retained in the coal yard without causing congestion. The importers should not be allowed to use the coal yard as their coal storage yard for prolonged period. Presently the yard is also used by them for segregation of coal dust which is and industrial process and causing nuisance in yard. The quantity of coal which can be retained in the yard at a time should commensurate with the maximum allowable height of the heap at 5 mtrs. Additional space may be provided by KPT if the existing space is not sufficient.
KPT and the coal handling agencies should jointly work to improve the aesthetics in the area. Plantation of tall dust resistant trees on both sides of the boundary wall has been recommended.

Certain socio-economic provisions have also been suggested together with the reminder of CSR role of the Coal handling Agencies.

8.3 Recommendations for Infra-structure
The Infra-structure needs to be improved substantially. The truck paths should be well defined and free from coal. Someone has suggested that the truck path should be all around the inside of the boundary wall. This may be considered.

Proper drainage system is to be provided for rain water or water accumulated otherwise. The drain water can be led to a tank from where it can be retrieved for spraying use after filtration. The Coal Handling Agencies should directed to improve housekeeping and maintain cleanliness. Their Containerized offices should be placed in orderly manner and some plantation may be arranged.
8.4 Recommendations for Equipment.

A number of equipment have been suggested in the EIA. These should be arranged as feasible at the earliest.

However Segregation should not be allowed unless conditions suggested in Sec. 6 in this context are met.
KPT’s Environment Policy

Introduction

The Karachi Harbour which spreads over an area of 62km2 receives a wide variety of pollutants from numerous sources which include land based as well as marine based discharges in the harbour.

In realisation of its responsibility KPT embarked upon a massive Harbour Pollution Management Programme under KPT Modernisation Projects Port V. The Marine Pollution Control Department has adopted stringent measures against influx of pollutants in the harbour concurrent to massive cleanup operation. The Department has been provided with Oil Spill Response Equipment sufficient to address medium sized oil spills.
The maintenance cleaning of harbour surface pollutants is being done on daily basis through a dedicated debris collection boat and four boats hired for manual picking up of floating garbage.

The measures adopted by KPT in past few years have mitigated the influx of Marine Based Pollutants to a great extent. The normal activities of MPCD include:

- In cognisance of its responsibilities towards protection of environment Karachi Port Trust has during the past few years accorded top priority to rehabilitate and uplift the marine environment in Karachi harbour;
- This policy provides an over arching frame work for measures to be adopted by the KPT to address the environmental issues and interaction with relevant governmental and nongovernmental organisations; and
- The policy also spells out broad environmental guidelines for the departments actively involved in port operations and their satellite private concerns. It aims to protect the environment through pollution control and effective management of ecology, natural habitats and water quality.

**Vision**

To achieve an absolutely clean and healthy harbour environment through the adoption of environment friendly practices working on the slogan “Environment Today Should Be Cleaner than Yesterday.”

**Goal**

The KPT environment policy aims to protect the harbour environment, conserve natural resources of the harbour in order to improve the working environment and quality of life of the people related directly or indirectly to the port operations.

**Objectives**

The objectives of the policy include:

- Meeting national and international obligations effectively in consonance with national policies;
- Protection and management of the environmental resources in the harbour;
- Mitigation of environmental pollution;
- Integration of environmental considerations in planning and development projects; and
- Capacity building and promotion of awareness.

**Sectors**

The following sectors have been identified.

- Pollution control and Solid waste management;
- Marine biodiversity;
· Mangroves forest;
· Air Quality and Noise;
· Energy efficiency and renewable sources considering global warming / climate change;
· Multilateral environmental agreement;
· Environmental impact on trade and shipping; and
· Contingency planning.

Implementation

A world class Marine Pollution Control Centre has been set up by KPT which is equipped for oil spill response, debris collection and a laboratory for water quality monitoring. KPT staff is trained for activities covering all aspects of protection of Marine Environment.

The Karachi Harbour, which spreads over an area of around 62km² receives diversified pollutants from Land Based as well as Marine Based sources. These include around 200mgd of untreated Industrial-cum municipal waste from the city, operational wastes from hundreds of fishing crafts in Karachi fisheries; refuse from various industrial and commercial premises situated on the perimeter of the Harbour and operational emissions from Ships calling Karachi Port.

The MPCD has been assigned following objectives to address the said issues.

a) To address all issues related to protection of environment and pollution control in all areas within Port limits;
b) To undertake immediate, cost effective, low-tech clean-up operation in the Harbour;
c) Training of Staff in combating Marine Pollution and efficient use of Pollution Control Equipment;
d) To monitor the Oil Piers for detection of possible Oil spills and provides a quick response;
e) To ensure implementation of international convention including MARPOL 73/78, LDC, etc to which Pakistan is a signatory since November 1994;
f) Administer the Oil spill contingency plan up to Tier I level; and
g) Create awareness among KPT worker and port users regarding environmental issues in the Harbour.

To meet the above objectives the MPCD conduct following activities on regular basis:

· Oil Spill Response;
· Ships Inspection;
· Harbour Surveillance;
· Harbour Cleaning;
· Environmental Audit in Oil Installations Area;
· Water Quality Monitoring;
· Fitness of Oil / Water Barges;
· Fencing of Oil Tankers by Oil Boom;
· Monitoring Shore Disposal of Wastes;
· Rehabilitation of Mangroves;
· Cooperation with other Agencies;
- IMO Workshops; and
- Scrutiny of Environmental Impact Assessment Reports.

**Ship Inspection**

Through this inspection it is ensured that the ship does not cause any pollution in the Harbour. Records related to production and disposal of oil sludge / plastic during past six months are checked to verify if the ship has discharged this stuff in the oceans, which is strictly prohibited. The ships bilge water overboard discharge valves are required to be kept chained and locked in the Harbour. Performance of oily water separator is checked and it is also ensured that the ship does not have any connection through which oily bilges can be pumped overboard without passing through oily water separator even in open seas. This inspection is conducted strictly in accordance with provisions of MARPOL 73/78 and in case of any contravention the ship is issued warning and subsequently penalised. The penalties have created sufficient deterrent and the Harbour has acquired cleaner surface in the context of oil pollution.

**Garbage Disposal**

Dumping of garbage, of whatever kind, is strictly forbidden. The MPCD strictly monitor the disposal of garbage from ships which can only be done through contractors licensed by MPCD for the purpose. Besides garbage disposal of all other waste such as slops, sludge from ships is also done through license contractors.

**Strategy for the Conservation of Mangroves**

Although the Mangroves Forests have depleted substantially on the entire coast of Pakistan but KPT is protecting the mangroves of harbour in the greater national interest.

*Rehabilitation of Mangroves*

a) Nursery Establishment

KPT is working on rehabilitation of mangroves in Chinna Creek Area. 2 Nos. onsite nurseries have been established but the survival rate of saplings is not satisfactory. However a nursery set up at the Marine Pollution Control Center using a new technique of sowing seeds in plastic bottles has been quite successful.

b) Transplantation of Wildlings

Natural regeneration has also been utilised through transplantation of wildlings from the crowded to the denuded areas in Chinna creek.

*Awareness*
Meticulous Management of Coal Handling

MPCD has been vocal about the importance of mangroves at different forums. Also MPCD’s articles/newsletter appears in print media from time to time.

Co-ordination & Linkages
MPCD has developed close co-ordination with other conservation agencies for the protection of mangroves. KPT supports WWF and IUCN’s community motivated program in this regard.

Monitoring & Surveillance
KPT ensures full protection of mangroves from the illegal poachers.

Ecological Replacement
For any development work in the harbour the MPCD recommends to avoid the usage of mangroves land. If unavoidable MPCD ensures ecological replacement of equal quantum of mangroves consumed during development activity.

Harbour Surveillance
Strict surveillance of the harbour is carried out once or twice a day during which pollution status form is filled up. This form is basically a layout of the harbour on which presence of pollutant is entered through notations. Also if there is any evidence / indication of pollution caused by any ship, craft or cargo operations, the polluter is issued memo and subsequently penalised.

Harbour Cleaning
KPT has arranged to collect the debris from harbour waters on daily basis. One Debris Collection Boat, built for the purpose has been acquired by KPT. In addition four Boats hired for the purpose are deployed during light hours. Furthermore solid floatation Booms are deployed at strategic locations to arrest floating debris.

Oil Spill Response
The department has been provided with oil spill response equipment consisting of oil booms, skimmers, and dispersants spray systems, floating and onshore collapsible tanks, work boat etc, sufficient to combat medium sized oil spill. With an experience of around Eight years during which regular spill response exercises have been conducted. KPT’s Oil Spill Team stands high in expertise in the region.

Fitness of Barges
The oil barges plying in the harbour are issued NOC by KPT for their annual certification for which the barges are inspected to ensure that they have sufficient arrangement to avoid oil spillage during operation. Also it is ensured that the oil spaces of the barge have proper sealing arrangement so that no oil is released in case of sinking of barge.

Environmental Audit in Oil Installations Area

KPT conducts door to door environmental audit of oil and chemical handling companies in the oil installations and timber pond areas. Normal operational discharges are examined and Companies discharging their operational wastes into sewerage lines are issued memos for explanation. Companies have been asked to improve their internal and external environment.

Water Quality Monitoring

The department has a laboratory for water monitoring of quality of harbour water and fresh water which is supplied to oil tankers. The Laboratory is equipped with Spectrophotometer, BOD Incubator, Dissolved Oxygen / TDS / Conductivity Metre and other devices for checking important pollution parameters.

Shore Reception Facility

The ships calling port need a facility where they can discharge their oily wastes and garbage generated during sea passage. This facility is provided to ships through private contractors. The activities of the contractors from receiving the waste to its final disposal are monitored by MPCD, KPT.

Shore Reception Facility for Discharge of Oil Tankers Washings

The oil tankers calling Karachi, at times, need facility to get rid of tank washings contained in their slop tanks. This facility is available at only a couple of ports in the region. KPT has arranged to receive tank washing from oil tankers at Oil Pier-III.

Promotion of Awareness

Besides operational activities the department promotes environmental awareness among the general public in particular the port users, visitors and inhabitants of localities in the harbour area. The staff members of this department visit these areas from time to time for the purpose. Notices are periodically served to Hotels, Passenger Launches, Service Station and Stevedores to refrain from dumping their garbage etc. in water.

Cargo Handling
Strict Port Surveillance is done by MPCD Staff to check the cargo handling activity which can cause pollution in the harbour. In case of dropping of waste / packing material etc the Stevedore is penalised.

**SOP’s to Mitigate Pollution during Handling of Coal**

The Standard Operating Procedures (SOP), for minimising pollution during handling of coal have been prepared in Consultation with DTMs Mr. M. A. Abbasi, Mr. N. A. Jesser and Traffic Officer Mr. Kazim. The SOPs have been communicated to the Secretary, Stevedores Conference and the specific Stevedores, for strict implementation.

*Standard Operating Procedures*

The Traffic Dept includes ‘relevant instructions’ as per SOPs in each letter for “allotment of plot” issued to the stevedores for stacking of coal.

Before Commencement of cargo operation the Traffic Inspector Wharf ensures that tarpaulins of suitable size are rigged up between ship and berth to avoid spillage in sea.

The attending outdoor clerk (checker) of Traffic Department ensures that:

- No truck is topped up above the hatch level;
- The grab from ship’s crane is not opened before reaching the top of the heap on the wharf;
- The truck does not leave the wharf without covering the hatch by tarpaulin; and
- The tarpaulin is lashed at least 3 points on each side of the truck.

The Port Security Force personnel at the gate do not let the truck pass if it is not properly covered or if there is any spillage of cargo from any opening; The PSF Mobile Staff checks the trucks for these violations during the passage from Gate to Coal Stacking Yard. They also keep a check on the speed of the truck which should not exceed 15 km/hr on levelled and clear road.

The relevant staff of the Traffic Department at the wharf and at coal stacking area ensures that the stevedores arrange for time to time spraying of water on coal heaps covering the entire surface area to avoid spreading of dust.

The MPCD Staff maintains frequent surveillance of the area and ensures that the stevedores maintain workforce at a minimum of 2 persons per 150m of the road for prompt cleaning of the area through which the trucks pass. In case of any violation the MPCD staff issues memo for penalty to stevedores. The penalty however is approved by the General Manager (Operations) on case to case basis. Also the Traffic Department Rep or PSF Rep. on the spot counter signs the memo and gets the signature / thumb impression of the truck driver or cargo foreman, as the case may be.

**SOP’s to Mitigate Pollution during Handling of Coal**

The Standard Operating Procedures (SOP), for minimising pollution during handling of coal have been prepared in Consultation with DTMs Mr. M. A. Abbasi, Mr. N. A. Jesser and Traffic Officer Mr. Kazim. The SOPs have been communicated to the Secretary, Stevedores Conference and the specific Stevedores, for strict implementation.
Standard Operating Procedures

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The imposition of penalty is normally at following rates

- a) Cargo operation without tarpaulin between ship and berth. Rs.10,000/- against each memo minimum
- b) Opening of grab at level higher than top of the heap on the wharf. Rs.1000/- each time
- c) Loading of truck above hatch level. Rs.1000/- each truck
- d) Incomplete covering of truck hatch. Rs.2000/- each truck
- e) Not spraying water on complete area and allowing the coal dust to spread in atmosphere at berth and at coal stacking yard Rs.2000/- each memo
- f) Spillage of cargo by truck on the way. Rs.2000/- against each memo
- g) Number of persons deployed for cleaning the entire passage of trucks from wharf to coal stacking yard less than 2 persons per 150m. Rs.1000/- against each memo

The above penalties have been kept low to establish the penalty system; these would be enhanced in future if found ineffective.

KPT Mangroves Policy
Preamble
Whereas the slogan “Environment today should be cleaner than yesterday” has been strictly practiced by KPT since its adoption in 1996, in all its day to day affairs, the development projects and capital investment have always been governed by the principal “Protection of environment and port development should be parallel. One should not be at the cost of other.”

‘KPT’s Environmental Policy’ has been chalked out to ensure strict implementation of this guideline. The KPT’s Mangrove Policy is one of the components of the Environment Policy.

Mangroves
Mangrove trees / forests are the principal component of a highly productive marine ecosystem which converts organic silt into Mari-culture proteins. They are found mostly in deltaic region, estuaries, etc. in the tropics and sub tropics. Besides providing food and habitat for commercially important fish species they play major role in shoreline strengthening and land formation through silt deposition. They are also used as fodder fuel, timber, ethnic medicines, and pulp for paper, habitat for birds, honey and for recreation.

The physical requirement for Mangroves plantation is medium salinity, organic silt and shelter from wind although they themselves provide shelter to land from floods. They survive in oxygen depleted mud as their aerial root protrudes out of the earth for breathing.

In view of tremendous ecological and economical benefits provided by Mangroves to Mankind it is essential that these mangroves are preserved and protected from all threats particularly pollution and population pressure. This policy is purported to not only provide protection but also to rehabilitate the denuded areas in Eastern and Western Backwaters of Karachi Harbour.

Mangroves in Pakistan
The Indus Delta Mangrove Forest which used to be 6th largest in the World at one time is now the 35th largest covering 860,000Ha. However the total area available for mangrove on the Sindh Coast is 600,000Ha. Intrusion of Seawater in the Indus and mismanagement are the two main attributes for shrinking of Mangrove population. Makran Coast has a total of 7,000Ha covered by mangroves.

Mangroves in Karachi Harbour
The Mangroves are found in Eastern and Western Backwaters of Karachi Harbour. These Mangroves provide natural protection against land erosion and floods besides being an ideal place for roosting birds and of course highly productive nursery, for Juvenile fish and shrimps. The “Once- upon-a-time” thick green forest in the Eastern and Western Backwaters have depleted and thinned down due to pollution and enormous population pressure. The total area covered by mangroves in these backwaters is approximately 700Ha. Out of the eight species which were found in the area about a
couple of decades ago, now there are only two species namely *Avicennia marina* and *Rhizophora, Avicennia* being the dominant species.

**Threats to Mangroves in Karachi Harbour**

**Land-based Pollutants**

Around 225 million gallons per day of untreated industrial and municipal effluents enter the harbour through 6 Nos. major drains and 13 Nos. small outfalls and play havoc with the Marine Environment. The major drains are:

a) Lyari River 164mgd;
b) Karli Nallah 7mgd;
c) Pitcher Nallah 7mgd;
d) Railway Nallah 4mgd;
e) Frere Nallah 27mgd; and
f) Nehre-e-Khyam 16mgd.

The pollutants detrimental to mangroves are:

- Toxic pollution from industries;
- Heavy metals;
- Oil and greasy material; and
- Non degradable solid waste.

**Cutting by Loggers on Commercial Basis**

Cutting of mangroves on commercial basis has been a great threat to this ecosystem. Residents of slum areas such as Macchar colony, Hijrat colony and Sultanabad are involved in commercial logging. These residences are used by the timber merchants for this illegal harvesting;

- There is multipurpose utilization of the mangrove wood; and
- All threats to Mangrove are to be addressed in letter and spirit. Accordingly illegal cutting of mangroves is being harnessed through strict monitoring which include deployment of armed patrol boats and installation of long distance video cameras.

**Land Encroachment**

- City population is increasing everyday; and
- There is a tendency of Encroachment in the Mangroves rich area on the backside of New truck stand at Mauripur and Hijrat Colony in the Channa Creek where Mangrove are cut off by illegal settlers.

**Diversion of Waste Water Flow**

- Shortage of non-saline water;
- Reactivation of the Clifton pumping station; and
- Recycling of treated water from sewage treatment plant.

**Conservation Strategy**

Although the Mangroves Forests have depleted substantially on the entire coast of Pakistan including Karachi Harbour, KPT is striving hard to conserve the existing forest and rehabilitate the denuded areas.

1. **Promotion of Awareness**

Besides being quite vocal at different forums / meetings, KPT interacts with the local communities and NGOs on the issues of protection of this valuable natural
asset. Articles written in this regard by KPT appear in the print media from time to time.

2. Co-ordination & Linkages
MPCD maintain close co-ordination with Governmental and Non-Governmental agencies for the protection and uplift of Environment. WWF and IUCN’s community motivated program for the ecological appreciation including plantation of Mangrove have been extensively supported by KPT. WWF’s Wetland Centre at Sandspit has also been an outcome of KPT-WWF cooperation. KPT welcomes ideas and efforts from any organization/corporate sector towards improvement, rehabilitation or development in mangrove forest in KPT areas.

3. Monitoring & Surveillance
The Marine Pollution Control Department of KPT with the help of the Port Security Force ensures full protection of mangroves from the illegal poachers. Armed patrol boats have been deployed to keep the mangroves intact. Surveys of Chinna Creek are carried out frequently to identify areas where ‘land grabbers’ have encroached onto the mangrove area. Measures are in hand to obviate further encroachment.

4. Ecological Replacement
For any development work in the harbour cutting of mangroves is prohibited and the proponents are asked to go for other options even if they are quite expensive. However, if no option is available than cutting would be allowed, only under the following conditions:
   a) The cutting should not have a significant impact on the ecological balance; and
   b) Ecological compensation to be made through planting of at least twice the number of cut off trees in the denuded areas and their monitoring till their stabilization.

Rehabilitation of Mangroves

Nursery Establishment

1. KPT is engaged in rehabilitation of mangroves in Chinna Creek Area whereas plantation is being done in Sandspit area by WWF and IUCN. Initially on-site nurseries were established but the survival rate of sapling was very low due to strong tidal currents. With the adoption of a new technique of sowing seeds in plastic bottles in an in-house nursery and transplanting them at a height of 25 - 30mm the survival rate has improved to a great extent; and
2. KPT is presently managing a nursery of 6 - 8,000 saplings of *Avicenna marina*. The capacity is to be increased gradually to 15,000 saplings. In addition sowing of Rhizophora would continue but the saplings would be handed over to WWFPakistan for plantation at Sandspit.

KPT welcomes all suggestions and technical input on the above policy.