Arab Republic of Egypt
Cabinet of Ministers
Ministry of State for Environmental Affairs
Egyptian Environmental Affairs Agency EEAA
Environmental Management Sector

Environmental Impact Assessment Guidelines for Cement Manufacturing Plants

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1 INTRODUCTION

The purpose of these guidelines is to identify the main factors to be considered when preparing an Environmental Impact Assessment (EIA) study for cement manufacturing plants. Each project should be carefully assessed to identify the key issues and an EIA to assess these, using these guidelines for assistance.

The issues presented here are equally applicable in preparing a Compliance Action Plan (CAP). They will also assist in identifying those issues which are of most concern to the relevant government agencies.

Not all matters in these guidelines will be applicable to every proposal. The EIA must be tailored to suit the potential impacts of the specific proposal at the specific proposed location(s), and it is essential to focus on relevant key issues.

The EIA report should be submitted via the Competent Administrative Authority to the Egyptian Environmental Affairs Agency (EEAA). The Competent Administrative Authority for Cement Manufacturing Plants is the Ministry of Industry and Mineral Resources.

Use of this guideline alone will not be sufficient to prepare an EIA. Reference should be made to relevant laws and other guidelines, such as Law 4/1994 for the Environment, Law 48/1982 protecting the River Nile and its waterways from pollution, Law 86/1956 concerning mines and quarries, Law 96/1962 concerning disposal of waste water to municipal sewers, Law 102/83 for protected areas, EEAA Guidelines for Egyptian EIA, Military Governor Decree No. 2 for 1996 regarding the limitation of polluting industries in the vicinity of the capitals of the Governorates, and other relevant ministerial decrees. Developers should be aware of their obligations under all laws and guidelines applicable to their situation.

2 OBJECTIVE OF THE ENVIRONMENTAL IMPACT ASSESSMENT

The aim of Environmental Impact Assessment (EIA) is to enable the approving authority and the developer to properly consider the potential environmental consequences of the project and to make recommendations to reduce it.
It is important to provide sufficient information for the approving authority to make a decision on whether to approve the project and if so, under what conditions. The information provided should be clear, objective, and supported by maps or other descriptive detail.

3 THE EIA PROCESS

The EIA should be prepared by a team of consultants with experience appropriate to the study of the different aspects of the development site. The team should be headed by a project manager with sufficient relevant experience, whose ultimate responsibility is to co-ordinate the inputs of individual specialists and to provide an overview.

The EIA study could be done through a company or joint venture of consultants to ensure a full professional coverage.

The EIA process should proceed through a number of steps:

3.1 Description of the project: What type of projects, its size, components, and processes expected, all stages of implementation?

3.2 Screening: is an EIA required?

3.3 Scoping, or identification of potential environmental impacts: What has to be covered in the formal EIA and in what detail?

3.4 Baseline: What are the existing environmental conditions?

3.5 Prediction: What environmental impacts will the project have?

3.6 Evaluation: How will these impacts affect people and resources, and how significant are the resulting effects?

3.7 Mitigation: Can significant negative effects be avoided or made acceptable? Can benefits be enhanced?

For EIAs for cement manufacturing plants, members of, or advisers to, the team may include, but not necessarily be limited to, the following:

- an environmental management specialist
- a socio-economic specialist
- an industrial process engineer

Each member of the team, for their specialist subject(s), will follow the basic steps identified above.

4 GUIDELINES FOR THE EIA REPORT

These guidelines provide advice on the content of formal EIA's for both developers and consultants involved.

The guidelines are not exhaustive. They are intended to identify the main issues of concern related to the construction or expansion of cement manufacturing plants. Developers must carefully assess each individual element of their project to ensure that all issues relevant to the site have been identified.
The suggested contents for the EIA report are:

A Non Technical Executive Summary
B Description of the Proposed Industrial Development
C Background Information covering the Legislative Framework, Methodology, Consultation and Consideration of Alternatives
D Description of the Existing Environment – the Baseline
E Prediction of Impacts and Evaluation of Significant Environmental Effects
F Mitigation including the Environmental Management Plan and Monitoring
G Conclusions

A. Non Technical Executive Summary

The summary should give an overview of the proposal, the alternatives considered, the time schedule for construction, the potential environmental impacts and their effects, and proposed mitigation measures. It will conclude by setting out the residual effects of the development after mitigation. It should

be written in non-technical language to help all readers to understand it.

B. Description of the Proposed Industrial Development

B.1 Objectives and Scope of the Proposal

There should be a clear statement of the objectives and scope of the proposal including:

- A general description of the proposed built development or the land uses expected such as port facilities, chalk pits, limestone, clay, pyrite, gypsum and sand sources and their reclamation, storage facilities (raw materials, product, waste etc.), buildings (administration etc.), installations (kilns, mills/grinders, separators, heat exchangers, stacks), tanks (above ground and underground) etc.
- The reason and/or need for the development;
- The proposed programme of construction works for development
- The expected project life;
- Land ownership/tenure; and
- Any designations such as zoning (including any marine zoning) which affect the site. This includes to investigate if there is any protected zones in the surrounding areas, such as nature reserves, drinking water interests (groundwater and/or surface water), recreational areas which will be affected of the proposed development

B.2 The Location

A site description and maps, plans or photographs should be provided clearly identifying the location of the proposed development relative to:

- Land uses in the surrounding area, both urban and rural, e.g., housing, industrial activities, agriculture;
- Water bodies and surface water, e.g. rivers, lakes and canals and the use made of these, e.g. fishing, water supply, navigation, irrigation;
- Habitats both natural and man-made for flora and fauna;
- Infrastructure including transport and utilities;
- Any local or regional strategy such as management plans for nature conservation areas;
- Any historical sites or environmental protection areas.

B.3 Detailed Description and Layout of the Proposed Industrial Development and Associated Facilities

The following information should be provided:

- Site plans which must show the maximum land area affected by the proposal, including port facilities, pits (sand, chalk, limestone, clay, pyrite, gypsum etc.), sand extraction areas, storage areas (e.g. raw material and fuel), cement plant location, etc.
- Layout plan(s) of the development showing buildings, stacks, storage areas for raw material and waste, roads, parking, and infrastructure including all utilities, such as fuel filling station, power supply, water supply.

- Elevations, cross sections and plans of all built development supported by photomontages or similar to show the visual appearance proposed;
- A description of the extent and type of industrial development proposed including a description of the uses proposed and the processes to be used. This includes the following information:
  - Flow chart of the proposed activity. Include sand, limestone, clay, pyrite, gypsum and chalk extraction activities, water catchments, port facilities, transportation, storage of raw materials, the cement process (mills/grinders, preheaters, precalciner, kilns), storage silos, packing facilities etc.)
  - List of machinery and process equipment – technical information (such as capacity and expected hours of operation) and operational control measures (emissions data such as NO_x, SO_x, dust, noise etc.)
  - An estimate of the essential types and expected consumption of raw materials and fuel types. This should include a description of the intention of reusing by-products or waste products from other industries. This might comprise granulated blast furnace slag from iron industries, aluminium silicate from refining of oil, "oxiton" from regeneration of aluminium scrap, calcines which is an intermediate product from cellulose industry, fly ash from the electro filters at the power plants.
- Power supply requirements and proposed energy conservation measures such as energy consumption during port activities, pumping activities (e.g. sand reclamation), transport activities (e.g. delivery of raw materials, transport of product), milling, mixing, pre-heating, pre-calcination, kiln processes.
  Furthermore, describe the energy conservation measures considered, e.g. kiln technology and heat exchanging.
- Proposed usage of water in the different industrial stages and sources of water supply (ground water, surface water and including discharges from any desalination plants) and options for water recycling and reuse;
- Quantities of solid and liquid waste generated and the arrangements for collection, recycling, storage, treatment and disposal (solid waste, hazardous waste);
- Transportation description including internal and external transport activities (transport of raw materials and product by train, truck, ship).
- Details of access, parking, and loading/unloading arrangements;
- Description of unloading of raw materials and loading of product. What considerations have been made to prevent unnecessary dust nuisance during operation
- Details of storage facilities for raw materials, type of storage, size, number, surface coating, roofing, drainage, measures to prevent dust problems etc.
- Details of storage of any hazardous, toxic or inflammable substances;
- Technical information of packing system, including expected dust and noise emission and what preventive measures have been considered.
- Identification of the proposed means of surface water drainage;
- The anticipated employment in operation

- The anticipated operating hours (week days, week end and holidays)
- The anticipated hours for transportation (internal transportation at site, delivery of raw materials and transport of product).
- Monitoring program
  Describe the monitoring programme planned to control the pre-heater, pre-calciner and the kiln processes during steady operation, e.g. temperature, O_2-content, water content.
- Risk management
  Evaluate the risk management considerations made during the programming/planning of the project., e.g.
  - monitoring of the pre-heaters, pre-calciners and kilns
  - noise during milling/grinding
  - packing (high pressure packing)
  - emergency and contingency planning

B.4 Site Preparation and Construction

Describe the construction works required prior to commencement of industrial operations, including:

- Timing, staging and hours of construction work;
- Proposed construction methods including temporary works, the equipment to be used and methods of transport of the equipment to the site;
- Proposals for environmental management during construction, e.g. erosion and sediment control systems, wastewater holding tanks, noise mitigation strategies;
- Any land clearing and/or disposal of cleared material;
- Any stabilisation structures or earthworks including the dredging, reclamation, excavation or landfill associated with these;
- Quantities of material to be moved to or from the site, the method of disposal of excess material, and the sources of material to be brought to site;
- Details of the construction workforce, including source, expected numbers and fluctuations throughout the construction period.

Furthermore, investigate types of previous activities on the land intended to be included in the proposed project:

- Previous activities that may have caused serious soil contamination and result in of any remediation measures
- Remediation of the site may be necessary prior to any building/construction activities
- What kind of remediation technology is possible (technical and economical)?
- What possibilities of soil treatment or disposal facilities exist?

B.5 Existing Development in the Locality

The description of the proposed cement industry development project shall outline:

- The nature of any past, existing or planned urban or other development on the proposed site;
- Past environmental performance, including the impacts of existing development on the environment and the effectiveness of any impact mitigation when applied on the site;

- The relationship of the proposed development to any existing development in the neighbourhood.

C Background Information

C.1 Legislative Framework

This section should set out the laws considered during the planning of the project, e.g. Law No. 4/1994 on the Environment and its Executive Regulations, Military Governor Decree No. 2 for 1996 regarding the limitation of polluting industries in the vicinity of the capitals of the Governorates, Governorate orders, land use, etc. A list of all approvals and licences required under any legislation should be included. This list should identify the relevant authorities involved in the assessment and regulation of all aspects of the proposal.

C.2 Method

The procedures or methodology used in the EIA should be outlined. The basic methodology of EIA is to:

- Establish the baseline or existing situation and any changes anticipated without the development concerned;
- Predict the impacts that will occur with the development;
- Evaluate the effects of those impacts for people, flora and fauna and for things, i.e. environmental resources such as land, water and the atmosphere;
- Evaluate how mitigation can be used to reduce the effects of a development;
- Describe the residual effects after mitigation.

This chapter should include details of:

- How the impacts have been predicted;
- The criteria used for assessing the significance of effects for both people and environmental resources.

This should be supported where necessary with:

- Relevant guidelines issued by government authorities, provisions of any relevant environmental protection legislation, and relevant strategic plans or policies;
- Relevant research or reference material, meteorological data and relevant preliminary or pre-feasibility studies.

The outcome of the screening and scoping process should be summarised including:

- All issues identified;
- The key issues which will need a full analysis in the EIA;
- Those issues which will not need a full analysis in the EIA but which still need to be addressed in a limited way.

C.3 Consultation

The EIA should list who has been consulted, how they have been consulted and what their views are. Consultants should include relevant government agencies, NGOs and the public. A brief description of the reason for consultation the outcome should be included.

For industrial development, agencies with regulatory powers or responsibilities in relation to planning control, roads and traffic, waste disposal, discharge limits to fresh waters, emissions to air, historic monuments, and conservation of natural resources must be consulted. These will include as a minimum the Egyptian Environmental Affairs Agency (EFAA). Governorate representatives, Ministry of Housing, Ministry of Reconstruction, Ministry of Transport, Ministry of Health, and relevant Community Development Associations (CDAs).

Consideration of Alternatives

The EIA should include a summary of alternatives to the development and the reasons why the proposed development is preferred.

Alternatives will include:

- Alternative locations;
- Alternative schemes and layouts of the development and services (these may be further developed under mitigation);
- Alternative management or operational practices (these may be further developed under mitigation); and
- The 'no development' alternative.

D. Description of the Existing Environment – the Baseline

D.1 Overview

An overview of the existing environment setting should be provided in order to place the proposal in its local and regional context. The detailed baseline information considered important to EIA for the cement industrial development proposals.

This includes:

- Land characteristics and use,
- Landscape Character and Existing View,
- Habitats, Flora and Fauna,
- Water including Hydrogeology, groundwater and water quality,
- Noise levels,
- Antiquities and other sites of historic and cultural significance,
- The social and economic context,
- Traffic flows and transport infrastructure,
- Utility service

Data must be relevant to the proposed development. The level of detail should match the level of importance of the issue in decision-making. To make the EIA report easier to read, it may be sensible to include the specialist detail for each of the following sections as a technical appendix to the report with a summary of each section in the main EIA report.

D.2 Land Characteristics and Use

All industrial development involves occupying land. The Baseline should therefore include:

- The existing surface characteristics such as topography soil characteristics, terrain stability and susceptibility to erosion or landslip;
- The existing land uses occupying the site;
- The existing surface characteristics of the surrounding area;
- The existing land uses occupying the surrounding area and particularly those land uses which

would be sensitive to industrial development.

Note that the land characteristics and uses will also be relevant to other parts of the baseline, e.g. landscape and visual character.

D.3 Landscape Character and Existing Views

Landscape quality may be affected by intrusion by industrial development and by loss of attractive features such as vegetation and hills. The baseline needs to describe:

- The existing character of the landscape both on the site and in the surrounding area;
- Views of the site from adjoining properties and public areas particularly where these are sensitive, e.g. residential, recreational or tourist areas.

D.4 Flora and Fauna

Flora and Fauna can be affected by emissions from cement manufacturing plants and by loss of habitats such as vegetation and water bodies. The baseline needs to describe:

- The existing habitats - terrestrial, aquatic or marine - both on site and in the surrounding area;
- The flora and fauna species present, their populations and their value which may reflect rarity, economic value and attractiveness.

D.5 Water Including Hydrology, Groundwater and Water Quality

Cement manufacturing plant development may have impact on the hydrology of an area and waterborne emissions may place the quality of both surface water and groundwater at risk. There is a need to understand the surface water drainage in the area even if this is very intermittent, e.g. flash floods every 50 years. Baseline data includes:

- Existing drainage. This includes the location and capacity of sensitive receptors like wadis, canals, drains and rivers; identification of areas prone to flash floods; depth to groundwater.
- Surface water and groundwater movement patterns. This includes groundwater hydrology, the range of water levels and daily flushing regime in canals, drains and rivers; tidal ranges and wave climate in coastal areas and sediment transport processes.
- The quality of waters, both surface water and groundwater
- Abstraction of waters. This includes abstraction of groundwater, damming and intake of surface waters. The usage of the waters for irrigation, public water supply or watering of animals. The quantity abstracted.

D.6 Air Quality

Baseline conditions include:

- Meteorological data particularly prevailing wind direction and strength, rain falls and temperature. Additionally, in relation to extreme situations like storms and draughts their occurrence and duration;
- Existing air quality particularly dust loading and existing sources of air emissions in the area
- Risk of inversion.

Existing air quality cannot be determined with any precision without sampling over an extended period. This is rarely practicable and a descriptive approach based on prevailing weather conditions and identification of the main local emission sources affecting air quality, e.g. road traffic, major heavy industries with stacks, is often a better approach. The most appropriate approach to atmospheric impacts is generally to prevent them at source. Most likely these data may be obtained from either the local airport or the local meteorological institute or department.

D.7 Noise Levels

Noise levels are relatively easy to establish and this is best undertaken at the nearest sensitive receptor locations, e.g. residential areas or schools, to the cement manufacturing plant development. Existing sources of elevated noise levels, which might result in nuisance at a considerable distance to the source, should be taken into account.

If noise measuring equipment is available noise should be monitored over a number of 15 minute periods during a typical working day. Ideally, 4 or 5 periods should be monitored at each sensitive receptor location. This will establish the background noise levels and the extent to which these are exceeded during the period monitored. Where noise monitoring equipment is not available a descriptive approach identifying the main sources of existing noise and the extent to which these cause nuisance may be adequate.

D.8 Antiquities and Other Sites of Historical and Cultural Importance

Existing sites may be directly disturbed by industrial development. Furthermore industrial development may affect the setting of antiquities or have adverse effects on them as a result of air or water pollution or vibrations caused by heavy vehicles. The baseline will need to:

- Identify any items of historical or cultural significance (both above and below water) on or in the area surrounding the site;
- Indicate the vulnerability of these to impacts from industrial development;
- Describe the use made of these sites, e.g. site frequented by tourists.

D.9 Social and Economic Context

Industrial development will generally impact on the local economy and may result in social change in area which mainly depend on agriculture and other primary sectors. The baseline includes:

- The general economic context including employment levels, existing industries in the local area, other proposed developments;
- The general social context including educational levels in the local population, participation in formal economic activities – particularly by woman, local cultural values.

D.10 Existing Transport Infrastructure and Traffic Flows

Traffic is almost always an issue for industrial developments. The baseline includes:

- Existing transport infrastructure including roads, railways, port and canals;
- Existing traffic flows on that infrastructure and anticipated changes which would take place even if the development did not proceed.

D.11 Existing Utilities Infrastructure and Usage

Industrial development will usually place demands on existing utility infrastructure notably water supply, sewage and waste water treatment, and electricity. The baseline includes:

- Existing utility infrastructure including water supply, sewage, waste water treatment works, power lines and transformer sub-stations;
- Existing capacity of and load on utilities infrastructure.

E. Prediction of Impacts and Evaluation of Significant Environmental Effects

E.1 Basic Methodology

This chapter should include a discussion of impacts both:

- During construction and any built or engineered development, and
- In operation of the proposed industry.

Examples of potential impacts of industrial developments and their significant effects include (but are not restricted to):

- Landtake leading to the loss of ecological habitats with negative effects on flora and fauna populations;
- Construction works which directly damage the existing landform and add to the impacts by landtake
- Economic impacts during construction which may create job opportunities and increase local business;
- Economic impacts during operation which may create longer term benefits, such as the creation of job and business opportunities, which have positive effects on the economic welfare of the local population;
- The provision of proper services and infrastructure with wider benefits to those living and working in the local area;
- Dust generated during construction or operation which may affect human, plant and animal growth;
- Gaseous emissions to air resulting in negative effects on heath of the local population;
- Discharge of untreated or inadequately treated effluent to canals and drains with resulting effects on water quality and potential adverse effects on crops and health;
- Disposal of waste, particularly that containing toxic or otherwise harmful compounds with resulting effects on amenity, water quality and land quality and potential adverse effects on crops and health;
- Noise which may disturb people in their homes, schools and other sensitive uses;
- Traffic which may increase delays and result in traffic related effects such as road accidents and traffic noise;
- Impacts on existing utility infrastructure and possible benefits as a result of improved infrastructure;

- Risks to local people as a result of the storage and use of inflammable or toxic substances.

There is a need to distinguish between impacts which are:
- Positive or negative;
- Reversible or irreversible;
- Temporary or permanent;
- Short term or long term;
- Direct or indirect.

in assessing environmental impacts and the significance of their effects:
- Who or what is affected must be identified;
- How they are affected must be described;
- These effects must be evaluated against a set of consistent assessment criteria.

Criteria for evaluating the significance of impacts and their effects should be set in advance. They should be based on local standards wherever possible. Where these are not available, acceptable international standards should be used (e.g. WHO, US EPA, etc. guidelines). In all cases the choice of the appropriate standard must be robust, defensible and relevant to the local situation. If no suitable existing standard is available, then the criteria developed and used must be clearly explained in the EIA.

The use of matrices can be very helpful in coordinating and summarising information for this section of the EIA report.

In this part of the report impacts should be considered before or without mitigation, except where the mitigation concerned is an integral part of the design and operation of the development.

E.2 Landtake

Industrial development almost always involves the development of land. Only where land has already been committed for the development of industry is landtake not an issue. This will occur where an industry moves on to an industrial estate which has already been developed with services and possible buildings.

Landtake may result in the partial or complete loss of:
- Ecological habitats with negative effects on flora and fauna population;
- Attractive landscape with negative effects on landscape character and the views enjoyed by people;
- Antiquities and sites of historical and cultural interest;
- Land in other uses, e.g. agricultural land or community facilities, with resulting impacts on people's livelihood or social life.

Note that even where land is taken for industrial development careful design can reduce impacts by retaining residual areas in their natural or existing state.

Landtake is normally evaluated on the basis of the area of land lost and the sustainability of that land for other uses, e.g. agriculture, urban development, recreation.

E.3 Construction Works

Construction works may directly damage the existing landform and add to the impacts by landtake. Even where the landtake for a development includes construction works which

impacts existing features. Key features which may be affected are:

- Surface water features,
- Landform,
- Existing vegetation,
- Antiquities

The effects are similar to those noted for landtake and in some cases these two impacts may be better considered together.

Landscape quality can be affected by intrusion by construction of industrial development and by loss of attractive features such as vegetation and hills during construction.

Loss of features is likely to have visual impact including changed or obstructed views. These could affect the views from adjoining properties and from surrounding land and water.

The impacts of construction works are generally identified on the basis of damage to existing environmental resources and the value of those resources.

E.4 Economic Impacts During Construction

All new industrial developments will involve some expenditure on construction. Where local contractors undertake this work there is an obvious benefit to the local economy; this is likely to be strengthened where the contractor makes purchases from other local businesses. In some cases contractors from outside the local area may win the construction contracts, while the benefit may be less, employment of local labour and purchases from local businesses will still benefit the local economy.

Estimates of benefits to the local economy can be based on an estimate of the number of local people employed during construction, the average duration of employment and the average rate of pay. Benefits to the local business can be based on an estimate of the proportion of construction spending which is spent in the local economy.

E.5 Economic Impacts During Operation

In operation industrial developments generally result in:

- Direct benefits the creation of job opportunities in the industries concerned;
- Benefits to other businesses in the locality as a result of multiplier effects;
- Losses to other local businesses in the locality as a result of competition.

In general the economic impacts of industrial development can be argued to be positive for the local population; this depends on the number of jobs created, the quality of those jobs and the net effects on local businesses.

Where new industries are introduced to an area an estimate should be made of the annual purchases of goods and services from existing businesses.

Estimating the negative impacts on existing businesses is more difficult. Often the presence of a number of similar businesses in an area is beneficial in that the local area gains a reputation in that industrial sector; furthermore the presence of several firms in the same industry may encourage the development of better skilled workforce.

E.6 Dust

Dust may be generated during construction of and in the operation of a cement manufacturing plant. During construction dust most often arises from vehicle movements on unsealed roads and from earthmoving operations using construction plant such as excavators. During operation of a cement manufacturing plant dust particles may be emitted from the following processes/activities:

- Quarrying operations of raw materials
- Grinding and blending operations
- Stacks from the kiln operation
- Raw material storage
- Packing
- Transport between the processes
- Transport to and from the site

However, the largest emission source, is the kiln operation, which includes the feed system, the fuel firing system, the clinker burning, cooling and hauling system.

In Egypt, the raw materials have a relatively high alkali content. In dry-process plants, the gases from rotary kilns carry with them a certain amount of dust particles that are rich in alkalis. Therefore, pre-heater and pre-calciner kilns are equipped with alkali by-pass systems. The amount of by-pass dust may rise as high as to 15 % of the clinker production. By-pass dust consists primarily of the following compounds: alkali sulphates ((Na, K) SO_4), alkali chlorides (NaCl and KCl), sulphate purrite ($2C_2S.CaSO_4$), free lime (CaO) and alkalis due to the combustion of fuel. Plants which produce low-alkali cement and use high alkali raw materials do not recycle dust to the kiln. Disposal of this dust is a serious plant problem. By-pass dust causes severe pollution to the environment that may cause adverse health problems in the area surrounding the cement plants.

Dust may be deposited on crops and in water bodies and watercourses; it may also reduce air quality with impacts on human health particularly where dust particles contain harmful matter. The generation of dust can have a negative effect on vegetation when emitted to the surrounding environment. The loss of vegetation produces extra runoff to the surrounding water bodies, which again can result in flooding. The major constituents in dust from cement manufacturing plants are alumina, silica, metallic oxides and clay, trace amounts of organic chemicals (dioxins and furans), heavy metals (cadmium, lead and selenium) and radio nuclides.

Existing dust levels in Egypt are strongly affected by weather and particularly the strength of winds from the desert areas to the east and west of the Nile Valley. At times the level of naturally occurring dust is such that dust arising from industrial development from whatever source is not likely to be noticed.

The accurate prediction of dust impacts is very difficult given the changing natural dust levels; an appropriate way of dealing with this subject is:

- To identify the main sources of dust attributable to the development and the scale on which dust may arise;
- To identify the people or resources that may be affected by this dust and the level of any nuisance caused; and
- To consider what measures should be taken to reduce dust from sources associated with the development to an acceptable level.

This approach is effectively based on reducing any emissions to a level which will not cause nuisance rather than attempting to predict impacts with precision. Data programmes modelling the dispersion can be an efficient tool when predicting the future impact from cement manufacturing plants.

E.7 Gaseous Emissions to Air

Gaseous emissions to the atmosphere may be generated both during construction and operation of a cement manufacturing plant. Emissions to air may be gaseous or in the form of particles loaded by adsorbed gases; the latter can be regarded as a constituent of dust which has been dealt with earlier. Gaseous emissions may reduce air quality with impacts on human health particularly where emissions are of harmful gases. The impact can be extremely serious, e.g. where emissions contain harmful compounds such as dioxins.

The main releases to air derive from physical and chemical reactions involving the quarrying operations of the raw materials and the combustion of fuels in the kiln system but grinding, storage and transport of fuels and raw materials also are a source to air emissions.

The typical gaseous emissions to air from cement manufacturing plants include nitrogen oxides (NO_x), sulphur dioxide (SO_2), carbon oxides (CO and CO_2) and dust. The emission of SO_2 depends on the content of volatile sulphur in the raw material and fuel, and does therefore not always represent a significant regulatory environmental aspect. Cement plant operation and literature on air pollution and abatement techniques generally focus on the above-mentioned three pollutants. However, other emissions are present as well; ammonia, VOC's, PCDD/ PCDFs (Dioxins), Metals, HF, HCl and Odour.

Existing air quality in Egypt is strongly affected by weather and particularly the strength of winds from the desert areas to the east and west of the Nile Valley. At times the level of naturally occurring dust in such a gaseous emission is likely to be masked by the dust loading.

The accurate prediction of air quality impacts is very difficult given the changing natural dust levels; an appropriate way of dealing with this subject is:

- To identify the main sources of gaseous emissions attributable to the development, the scale on which they may arise, the likely presence of harmful gases and the worst case concentrations likely to arise in the atmosphere given the dispersion characteristics of the site;
- To identify the people or resources that may be affected by these emissions and the level of any nuisance caused; and
- To consider what measures should be taken to reduce or avoid gaseous emissions from sources associated with the development to an acceptable level. Some of the primary measures when manufacturing cement are upgrading the kiln system. The measures should; reduce the fuel consumption, optimise the oxygen content, lower the flame and burning temperatures, stable the kiln operation. The upgrading could be installation of flame cooling, low NO_x- burner, selective non-catalytic

reduction, activated carbon, absorbent addition and/or scrubbers. The kiln system representing the so-called Best Available Technique is considered to be the dry process, with multistaged pre-calciner and pre-heater.

As with dust, this approach is effectively based on reducing any emissions to a level, which will not cause nuisance rather than attempting to predict impacts with precision. However, it should be mentioned that data programs modelling the dispersion can be an efficient tool when predicting the future impact from the cement manufacturing plant.

E.8 Emissions to Water

Emissions to surface water and groundwater may be generated both during construction and operation of a cement manufacturing plant. Waterborne effluent may reduce water quality with impacts on:

- Human health particularly where water is used for irrigation or public water supply,
- Freshwater and marine flora and fauna.

During cement manufacturing operations, effluent discharge is generated from cooling process equipment and wet scrubbing kiln stack emission for recovering cement kiln dust and as runoff water from the outdoor areas. Effluents contain mainly dissolved solids (Potassium and sodium hydroxide, chlorides and sulphates) suspended solids (calcium carbonate) and waste heat. Reduction of effluent discharge could be obtained by designing stormwater systems and storage areas to minimize wash-off of solids and recycling cooling waters. Effluent water could be recycled and reused using cooling towers or ponds, settling ponds, containment ponds and clarifiers.

Water quality impacts are easier to predict than air quality impacts. Existing water quality can be measured using a number of criteria such as the biological oxygen demand (BOD) level. Predictions of changes in water quality can be based on:

- Anticipated effluent discharges including volume, the concentration of suspended solids, concentration of harmful substances like the above mentioned, etc;
- Baseline data for the recipient water resources both surface and underground.

The criteria for judging the significance of impacts will include the people or resources that may be affected by changes in water quality.

The impact on human health from intake of effluents from Cement Manufacturing plants; The salts – chlorides and sulphates - make the water undrinkable before they reach seriously harmful concentrations. However, recent evidence is linking high intake of sodium chloride with high blood pressure. The possible content of metals in the effluent are of concern, as a number of metallic ions are known to cause metabolic disturbances in humans upsetting the production and function of certain enzymes. (e.g. aluminium concentrations are possibly linked with the incidence of Alzheimer's disease.)

An alternative approach can be taken, based on improving effluent quality

and reducing effluent volumes to levels which will not result in a significant impact on the water resources concerned.

E.9 Waste Disposal

Disposal of waste, particularly that containing toxic or otherwise harmful compounds, can potentially have adverse effects on amenity, water quality and land quality, on crops and people's health.

The waste generation at a cement manufacturing plant primarily includes particulate matter, including bypass-dust. However, waste is also generated when technical equipment is maintained (*Maintenance waste*: oils and other lubrication waste, spent organic solvents, sludge and solids from the paint and coatings, auto and truck assembly) and from the testing in laboratories. (*Product testing and research wastes*: Solid and/or hazardous wastes). The waste generation can be reduced by recycling collected particulate matter, reusing maintenance and laboratory waste as fuel and raw material substitutes.

Issues to consider include:

- The existing condition of any water body or groundwater that may be changed as a result of waste disposal both during construction and in operation.
- Potential liquid and solid wastes to consider include:
  - run-off from wash-down areas, fuel storage facilities, roads and parking areas
  - waste disposal (litter or solid waste),
  - toxic and hazardous waste

An approach based on the precautionary principle is appropriate.

E.10 Noise

The potential sources of noise associated with a development need to be identified; these are likely to include:

- Construction noise (e.g. blasting, pile driving, compressors, etc.)
- Operation noise (e.g. vehicle movements and from operation of the conveyors, the kiln system, the mills and grinders and packing machinery, both within and outside the factory).

If these are likely to be significant for particular receptors and resources, an assessment will need to be made of:

- Baseline conditions (including relevant meteorological and topographical factors, and existing major sources of noise);
- Proposed working hours during construction and operation;
- Where these impacts will be most important (e.g. housing areas and sensitive natural areas).

Data programmes modelling the noise level can help predicting the future impact from the cement manufacturing plant.

E.11 Traffic

A traffic study should be carried out for heavy vehicle movements, on street parking, boat navigation, train movements etc. Issues to study should include:

- Assessing the impact of traffic generated during construction and operation on the local and regional

transport network; issues to consider include
  - vehicle, train or boat size and types,
  - frequency of movements at various times of day and year (including the need for restrictions at night or peak periods),
  - safety issues.
- Estimating the average and peak movement and parking demands including the adequacy of on-site facilities.

For cement manufacturing plants especially delivering of raw materials and fuels, shipping of final cement product and transportation of raw materials and fuels internal on the plant between processes should be considered in relation to noise and air emissions.

E.12 Services and Infrastructure

The provision of proper services and infrastructure for industrial development may have wider benefits for those living and working in the local area. However, the reverse can be true where industrial development takes place without adequate investment in services and infrastructure and; existing services and infrastructure may become overloaded and the local community may be adversely affected.

In general, the impact on services and infrastructure is likely to be fairly neutral; a significant benefit is only likely to occur where the industrial development enables a major improvement to local infrastructure, e.g. a water treatment works, which could not be funded by the existing level of development in the area. For the cement manufacturing industry the local waste disposal could benefit, as many waste types can be reused as fuels for the kiln.

These impacts are generally dealt with by:
- Describing the anticipated changes in services and infrastructure provision,
- Considering the demands placed on provision by incoming industrial development, and
- Setting out how any changes in provision may benefit the local community.

E.13 Risk Assessment

Hazards can be assessed by:
- Identifying all materials stored which are classified as hazardous, their quantities and proposed safe storage and handling (e.g. fuel, raw materials, lubrication oils for maintenance and laboratory testing chemicals);
- Identifying potential hazards from fire, explosion or release of chemicals or polluted waters, natural occurrences such as floods, storms, landslip. (e.g. handling of fuels and packaging using high pressure, protection of storages from runoff waters, maintenance of discharge system for effluents, maintenance of machinery and abatement for air emissions, prevention of dust emissions from fugitive sources –like covering of transfer points and conveyors, water spraying point sources, paving, road wetting and wind barriers for open piles);
- Identifying potential risks to local people and local resources in the event of an emergency.

F. Mitigation

F.1 Mitigation Strategy

This section considers the mitigation strategy, including the consideration of alternative opinions, and the extent to which this will avoid or reduce significant effects. The evaluation of the strategy will take into account its:

- Sustainability,
- Integration,
- Feasibility, and
- Compliance with statutory obligations under other licences or approvals.

The mitigation strategy should outline the environmental management principles to be followed in the planning, design, establishment and operation of the proposed development. It should include specific locational, layout, design or technology features and an outline of ongoing management and monitoring plans.

F.2 Specific Mitigation Measures

These include proposed mitigation and management measures to control impacts on (the examples mentioned are only some out of many measures that could be taken for additional information Pollution Prevention notes from United States and the European Union can be recommended):

- Land quality – measures include:
  - Stabilization works for cuttings, embankments and open channels,
  - Erosion and sedimentation control structures (e.g. wind barriers),
  - Landscaping and re-vegetation proposals,
  - Control and disposal of solid waste (e.g. reused as fuel or at other industries).
- Water quality – measures include:
  - Control and treatment of liquid effluent (e.g. recycling cooling waters, cooling towers, oil separators, sand traps, ponds and clarifiers)
  - Contamination and recovery facilities,
  - Procedures for handling, storage, transport and disposal of waste for all hazardous and dangerous material (e.g. recycling of waste as raw material(dust) or fuel(chemicals), closed storages secured from stormwater runoff.)
- Air quality – measures include:
  - Control of stack emissions (e.g. cyclones, fabric filters and scrubbers),
  - Control in fuel inputs (e.g. substitution of fuels with high sulphate or ash content)
  - Control of optimised kiln operation (e.g. gravimetric solid fuel feed, reduced flame and burning temperature)
  - Control of fugitive emissions (e.g. encapsulating/covering conveyors, waterspraying and ventilation systems with cyclones in closed storage areas);
  - By-pass dust should be treated by using nodulizers equipped on the by-pass systems of the dry lines of clinker production. By this, the excessive dust generated during the process of loading the dust into the trucks may be eliminated, saving space at dumping sites. It can also be treated by using a circulating fluidized bed roasting system, involving dust preparation for the fluidized bed.
- Noise – measures include:

    - Control of noise from plant and machinery to ensure compliance with relevant standards,
    - Sound attenuation measures such as wall and banks (e.g. maintenance on noisy machines, rubber curtains of openings at mills and grinders, noise adsorbing claddings and encapsulation)
- Habitats, flora and fauna – measures include:
    - Compensatory planting or restocking of indigenous species,
    - Provision of new appropriate habitat,
    - Opportunities for colonisation,
    - Careful timing of major disturbances,
    - Measures to control and prevent infestations at the site and to control spread into localities adjacent to the proposal.
- Historical and cultural features – measures proposed should mitigate impacts and conserve antiquities and areas of historical or heritage significance during all stages of this development.

All measures must be compatible with the provision of relevant acts and laws.

F.3 Environmental Management Plan

An environmental management plan (EMP) is a document designed to ensure that the commitments in the EIA and subsequent condition of any approval or licence are carefully implemented. The EMP should demonstrate that sound environmental practices will be followed during the establishment, operation, rehabilitation and afteruse of the development. It should cover the following:

- Management of construction impacts (e.g. landscape management plans);
- Management of operational impacts (e.g. hazardous materials and fuel management, transport and packing management, maintenance and site security plans, emergency and contingency plans);
- Strategies and actions plans to feed information from monitoring into management practices;
- Public awareness and training programmes for operational staff;
- Indicators of compliance with licensing and approval requirements.

An EMP should include a monitoring plan that should be carefully designed and related to the predictions made in the EIA and the key environmental indicators. The EMP should outline the need for monitoring, its duration and reporting procedures.

Parameters which may be relevant include:

- Performance indicators in relation to critical operational issues including:
    - water quality (marine and fresh)
    - shoreline morphology and sediment budget,
    - soils and sediments
    - noise and air quality,
    - public health indicators,
    - land surface and hydrology,
    - flora and fauna.
- Waste management performance indicators in relation to recycling and reuse;
- Monitoring of complaints received

Monitoring procedures should cover the following:

- The key information that will be monitored (such as noise (low-frequency, infra sound and

vibrations), dust (particulate matter) and air emissions (NO_x, SO_x, CO, H_2O %, metals etc.), wastewater (volume, suspended solids, pH, substances etc.), waste (solid waste and hazardous waste) and odour), its criteria and the reason for monitoring

- The monitoring locations (Air emission outlet: particulate matter, NO_x, SO_x; the boundary: noise, odour, particulate matter, NO_x, SO_x and other relevant substances; out door storage areas of raw materials: dust fall), intervals and duration
- Actions to be undertaken if the monitoring indicates a non-compliance or abnormality;
- Internal reporting and links to management practices and action plans;
- Reporting to relevant authorities and, if appropriate to the consent authority or the community such as reports on interruption of operation, operational journals, list of used raw materials, protocol on stored raw materials, dust fall reports from the storage areas for raw materials, noise documentation
- Reports, odour and air pollution emission and immission concentration contribution reports, CO_2 % documentation reports, energy consumption reports, waste water reports etc.

G. Conclusions

This should summarise the prediction and evaluation of impacts, proposed mitigation and alternative processes, and residual effects after mitigation. It will emphasise:

- The more important impacts
- Who or what these will affect
- Whether mitigation is possible
- The likely success of mitigation measures adopted or recommended to alleviate those impacts

This information can be presented either as text or as summary tables if desired.

After mitigation measures have been assessed, residual and/or cumulative effects may remain. It is useful to set these out in a table in which the level of significance of each effect is given.