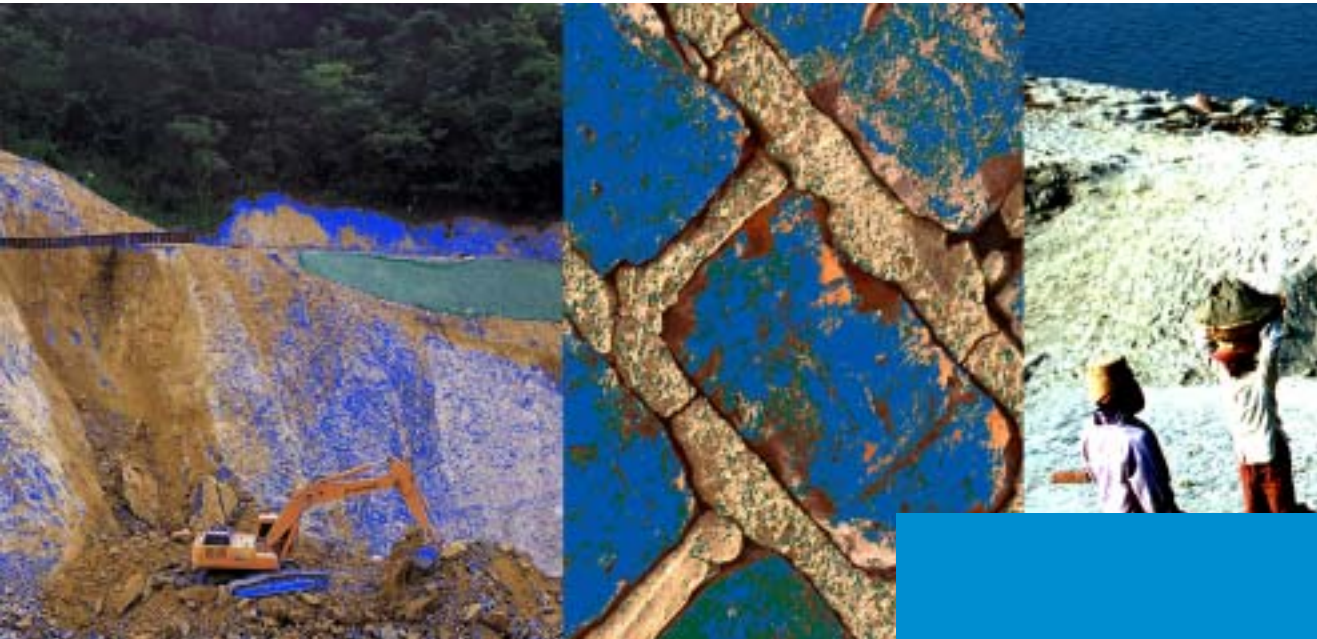


Cement Sustainability Initiative (CSI)



Environmental and social impact
assessment (ESIA) guidelines

April 2005

Land and
communities





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Executive summary

Introduction

The World Business Council for Sustainable Development (WBCSD) Cement Sustainability Initiative (CSI) has initiated a task force (one of six) to address the local impacts of the cement industry on land and communities. Impacts from quarries and cement plants may be positive (e.g. creating jobs and providing products and services) or negative (e.g. disturbance to the landscape and biodiversity, dust and noise). The most useful tool for evaluating and managing the impacts of a cement site is a thorough Environmental and Social Impact Assessment (ESIA), undertaken with rigorous scientific analysis and stakeholder engagement.

This CSI Task Force has produced concise guidelines for an ESIA process for the cement industry to enable cement companies and local communities to identify and address some of the critical issues during each phase of a cement facility's development, operation and eventual closure.

The ESIA process

An ESIA report will cover methods and key issues, the legislative framework, the consultation process, the social and environmental baseline, consideration of alternatives, prediction and evaluation of significant social and environmental impacts, mitigation or offset measures, and environmental and social management and monitoring plans.

The development of an ESIA will involve a range of parties with different roles and responsibilities including the developer of the facility, independent consultants, the relevant authorities and

government departments, external reviewers, financial institutions, local residents and communities, NGOs and interest groups.

Scoping phase / greenfield site assessment

At the scoping phase of a cement project, the ESIA will need to cover:

- > Details of the nature and roles of relevant **stakeholders**.
- > Existing and potential **land uses** and forms of **land tenure**, appropriate governance systems to ensure accountability and social justice, and changes to the infrastructure (e.g. for transport).
- > Social analysis, including the size and social structure of the local population, their needs, wishes, skills and capacity, and an assessment of the population's health status.
- > **Biodiversity** resources and **cultural heritage** assets, especially protected areas and species, and the geology, hydrology, soil quality, water resources, climatology and meteorology of the region.
- > **Alternative locations** for plants and quarries.

Construction phase

During the construction phase, the ESIA will need to cover:

- > Traffic impacts on air, soil and water quality, and health and safety.
- > Wastes from construction and overburden, soils and other materials.
- > Transitory population increase, especially any potential conflicts.
- > Temporary and permanent infrastructure developments.
- > Noise, dust and vibration from construction.

Operations phase

During the operations phase, the ESIA will need to cover:

- > The **social impacts**, focusing on community well-being, to include public health and safety, the living environment, satisfaction of basic needs (e.g. housing, sanitation, water supply), access to public services (e.g. health, education, training and recreation) and landscape aesthetics.
- > **Occupational health and safety** of workers and contractors, giving special attention to accidents and to the use and storage of explosives at quarries.
- > **Environmental impacts**, especially from land use and quarrying, the use of fossil fuels and raw materials, emissions, noise and vibration, solid wastes, liquid effluents and storm water, and traffic. The ESIA should also describe the environmental management system to be implemented.

Closure of site

The ESIA at this stage will need to cover:

- > **Rehabilitation** across the whole area affected by the cement manufacturing footprint, with special emphasis on managing hazardous areas and materials.
- > A **Future Site Use Plan** to provide sustainable benefits to the local community in the long term.
- > Plans for **alternative local social and economic** activities to replace those lost by closure.
- > **End of life monitoring**, particularly to measure diffuse low level contamination in soil or ground water (required by legislation in some locations).

Mitigation

Mitigation measures aim to avoid, minimize, remedy or compensate for the predicted adverse impacts of a cement facility on site; offset has similar aims but remedial actions are focused off site. Measures need to take into account potential impacts close to the site and those some distance away (e.g. impacts on water supply), and to ensure the avoidance of sites that are formally protected (especially for biodiversity and cultural heritage).

Stakeholder involvement

Stakeholders for the cement industry are all the individuals and groups who see themselves as potentially affected by, or who can impact on, cement operations at the local, national or international scale (e.g. neighbors, community organizations, employees, trade unions, government agencies, the media, NGOs, contractors, suppliers and investors). An active approach to stakeholder involvement generally leads to decision processes that proceed with less difficulty and greater benefits for everyone.

Stakeholder involvement commits the company to considering and (if appropriate) incorporating feedback from stakeholders, unlike a conventional public relations campaign. Companies therefore need to be clear about their objectives for working with stakeholders, have a reasonable timescale for engagement, commit the necessary resources, and be prepared to work with stakeholders to find mutually beneficial outcomes.



Acronyms used

BAT	Best available technologies / techniques
CKD	Cement kiln dust
CSI	Cement Sustainability Initiative
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and social management plan
EU	European Union
HIA	Health Impact Assessment
ICMM	International Council on Mining and Minerals
IIED	International Institute for Environment and Development
IPPC	Integrated Pollution Prevention and Control
ISO	International Standards Organization
IUCN	International Union for Conservation of Nature
NGOs	Non-governmental organizations
SOPs	Standard Operating Procedures
WBCSD	World Business Council for Sustainable Development
WHO	World Health Organization
WWF	WorldWide Fund for Nature



Introduction

The Cement Sustainability Initiative

Cement is one of the most widely used substances on the planet. It is the 'glue' that binds together the constituents of concrete and mortar in our buildings, roads and infrastructure. Each year, nearly three tons of concrete (containing 10-15% cement) are consumed for each man, woman and child. Making cement is an energy and resource intensive process with both positive and negative local and global impacts. Is it a sustainable business? Can it be made more so? What are the critical issues to address? What should the industry look like in the future?

Recognizing that they needed clearer answers to these questions, in 1999 several cement companies began the Cement Sustainability Initiative (CSI) as a member-sponsored program of the World Business Council for Sustainable Development (WBCSD) (see Appendix 6 for more details).

Six task forces have been established by the CSI to develop good practice guidelines and procedures to be used by all CSI companies at their operating facilities. These materials are also being made available on a worldwide basis for other cement companies.

This document is the product of the CSI task force examining local impacts on land and communities.

Environmental and Social Impact Assessments (ESIAs)

Producing cement has significant positive and negative impacts at a local level. On the positive side, the cement industry may create employment and business opportunities for local people,

particularly in remote locations in developing countries where there are few other opportunities for economic development. Negative impacts include disturbance to the landscape, dust and noise, and disruption to local biodiversity from quarrying limestone (the raw material for cement).

The way companies evaluate and manage the social and environmental aspects of siting, acquisition and closure of sites affects the quality of life of the communities involved, and the reputation of the cement industry. Maintaining a 'license to operate' as an industry is dependent on being able to earn and keep the support and trust of local people and this includes treating communities with respect.

Impacts may be:

- > **Direct** impacts on natural and social systems as a direct result of the project;
- > **Indirect** impacts on natural and social systems that may be secondary or 'knock on' effects, including direct biophysical impacts that can lead to secondary social impacts and vice versa;
- > **Cumulative** impacts on natural and social systems that accumulate over time and space.

The assessment of impacts on social and environmental systems requires a range of different approaches, methods and techniques. Direct impacts are relatively straightforward to identify, but the assessment of indirect and cumulative impacts is more complex and the determination of magnitude (size and extent of the impact) and significance (the importance for decision making) is difficult. Social impacts are often the most difficult to predict, due to the lack of a clear cause-effect relationship when working with human responses to change, meaningful baselines, etc.

The most useful tool for understanding and managing the impacts of a particular site is a thorough Environmental and Social Impact Assessment (ESIA). Through scientific analysis and stakeholder involvement, a good ESIA process helps a company identify the critical social and environmental issues associated with a project, and ensure that positive impacts are optimized and negative impacts are minimized and mitigated. An effective ESIA process can improve local community understanding of the whole project, increasing trust between the company and the local community, as well as increasing the sustainability of the project.

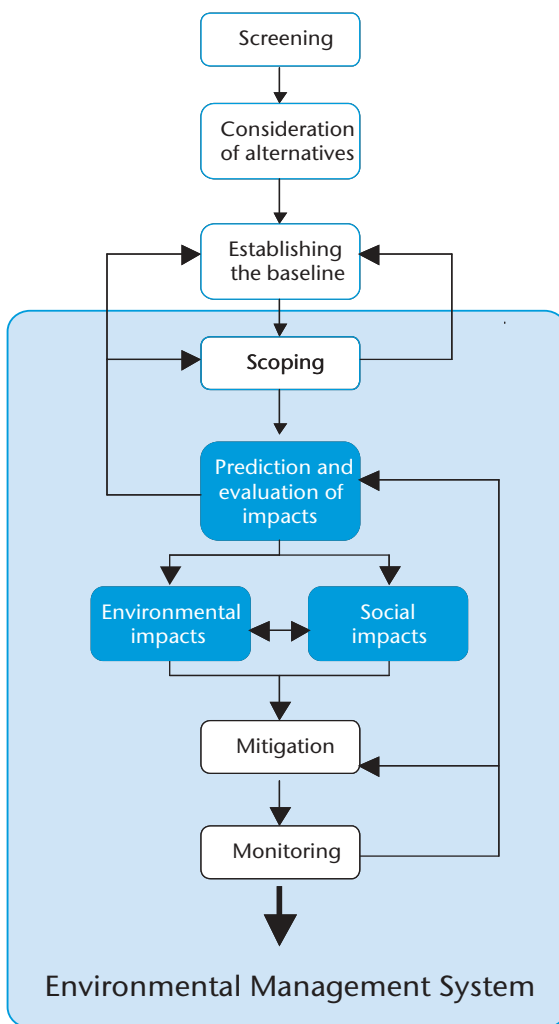


Diagram of ESIA process provided by the EIA Centre, University of Manchester, 2003.

It is most cost effective to carry out an ESIA prior to site development, to identify and resolve issues at an early stage, because of the large amount of capital funding involved in developing or altering a site. Assessments can also be useful during

operations to identify areas for improvement, and before site closures to assess options for rehabilitation.

The diagram above, of a typical ESIA process, shows the main stages of the process. It also illustrates the iterative nature of an ESIA through the numerous feedback loops to previous steps in the process. There is also clearly a significant potential overlap between the activities of the ESIA process and that of a typical Environmental Management System (e.g. ISO 14000).

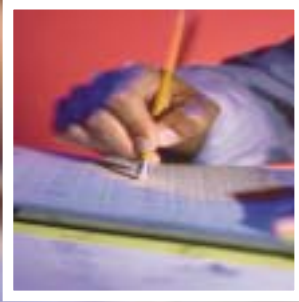
'Review' activities are not shown in this diagram. Review by environmental authorities and others may take place at different stages of the ESIA process (e.g. during screening), or following certain pre-determined deliverables (e.g. after submission of the ESIA). The diagram also does not show the potential for a 'no go' option as a result of the screening process, although that is a possible outcome of screening. An ESIA process may also result in a 'no go' decision.

These guidelines

The CSI has examined all the major issues and offers in this document a set of guidelines for cement companies and local communities considering an ESIA. These guidelines build on existing excellent work in this field by others (see Appendix 1 for examples), in which many of the concepts offered here for the cement sector are discussed at greater length and with broader application.

These guidelines are not intended to be comprehensive or prescriptive. Local circumstances vary greatly depending on geography, culture, economic development, etc, so an exhaustive list of hard and fast rules is not appropriate.

These guidelines therefore provide a basic framework for taking environmental and social concerns into account throughout the life of any quarry and cement plant from initial planning to construction, through operations to eventual closure (and restoration and re-use of the land). The guidelines identify the critical issues to consider in each phase, as well as proposals for addressing most of them.



Outline of ESIA Reports

Introduction

The ESIA process is not simply a matter of preparing a report, and obtaining approval (where local regulations require). The use of the ESIA framework can help ensure that the environmental and social concerns of local communities and other stakeholders are taken into account throughout the life of cement plants and quarries. It can provide linkages to other forms of social and environmental management, and a basis for communications with all stakeholders.

However, an ESIA report will be required, and an outline of coverage and contents and potential participants in the preparation of such reports are described below.

Coverage and contents

The ESIA should be tailored to the specific project and to the legal requirements, environmental and social conditions where it is situated. The coverage of the ESIA report itself will therefore depend on local circumstances.

A Systems Map may be a useful way of describing and agreeing the extent and boundaries of the proposed project, and its wider context, so that the sustainability impacts can be fully assessed. Identifying relevant stakeholders would be part of this mapping exercise, and those stakeholders can then be involved in the mapping process, which can help everyone understand the complex flow of impacts and feedback loops more easily.

The following outline for a typical ESIA report is offered on the basis that identified issues will not necessarily have the same degree of relevance for

all cement projects, given the importance of local context.

- > **Executive summary / non-technical summary.** The summary should be written in non-technical language and be accessible and understandable to the members of the interested and/or affected community.
- > **Methods and key issues.** A methods and key issues statement provides the opportunity to clarify some basic information about the ESIA including what difficulties have been encountered and the limitations of the assessment.
- > **Legislative framework.** This section should cover the relevant legislation and requirements of the country and region where the project is situated, and include a statement that commits the project to compliance.
- > **Consultation process.** The steps in the consultation process and the views expressed should be summarized in the report. If clear recommendations resulting from the consultation process were not followed, the reasons for those decisions should also be provided.
- > **Description of the existing social and environmental baseline.** This section should describe information collected on the past, present and future context for the project in order to provide a picture of existing trends resulting from natural events or human activities, the current state of the environment, the current socio-economic conditions in the region, and any potential future changes which may occur as a result of planned developments.
- > **Consideration of alternatives.** This section should present the results of an organized

process that has ensured that reasonable alternatives, of different types, have been considered. Alternatives may include demand, activity, location, process, input and mitigation alternatives.

- > **Description of the proposed development.** This section should cover the objectives and scope of the project, an overview of the project and its location, a detailed description and layout, the site preparation and construction, and the nature of the processes, resources and technologies to be used.
- > **Prediction and evaluation of significant social and environmental impacts.** This part should emphasize the most important impacts, who or what these will affect, and how significant the effects will be.
- > **Mitigation / offset measures.** This section should provide an assessment of the hierarchy of impacts and whether mitigation is possible, the likely success of the mitigation measures proposed to alleviate the impacts, and residual and/or cumulative effects. Any offset schemes proposed to reduce negative impacts should also be included.
- > **Environmental and social management and monitoring plans.** This section needs to provide a framework for managing and monitoring impacts for the life of the project and whether it is necessary to introduce corrective measures. It should be designed to ensure that the commitments made in the ESIA, and in any subsequent assessment reports, together with any license approval or similar conditions, are implemented.
- > **Bibliography.** A list of all references cited should be included in the report.

Roles and responsibilities

One of the advantages of undertaking an ESIA study is the collaboration that is created between various parties during the process. However, it is essential that the roles, responsibilities, rights and involvement of all parties in the process are clearly defined and agreed before the process commences.

The parties involved in any individual ESIA will vary, depending on where the project is located, what is required by legislation, who is involved in the financing of the project and the public profile

of the project. Country and area specific environmental assessment (EA) requirements usually contain a section on the stakeholders relevant to their specific processes, and often with clear descriptions of their individual roles and responsibilities.

Stakeholders in the ESIA process may include, but are not limited to, the following groups:

- > The project proponent and/or developer
- > Teams of specialists (possibly including independent consultants)
- > Relevant local public authorities, government departments and government agencies
- > External reviewers
- > Financial institutions
- > Local residents and communities
- > NGOs and community interest groups
- > Other institutional bodies, such as regional development forums and resource management organizations.



Scoping phase Greenfield site assessment

Introduction

An environmental impact assessment (EIA) is always recommended for the construction of a new cement plant with related quarries. A screening stage, to decide whether or not an ESIA is needed for a particular project, may therefore be much less significant than on some other projects. The first major assessment of the environmental and social impacts is therefore likely to be during and after the scoping phase (see European Commission guidance on screening and scoping; reference in Appendix 1).

Scoping may address:

- > the baseline studies that are required to characterize the existing environment;
- > the types of alternatives to be considered;
- > consultations with relevant stakeholders (see “Stakeholder mapping”).

The significance of both positive and negative impacts will need to be assessed by weighting them against local conditions. Standards of comparison will need to be defined for every issue to be analyzed, as well as any pre-established limits to acceptable change (defined by legislation, by recognized experts, stakeholders etc) which the proposed development should not exceed, and the trend of change in the area if no development takes place.

The complete analysis of all the necessary issues in the scoping stage may take more than a year, bearing in mind the necessary interactions with others and consideration of alternatives.

Stakeholder mapping

Stakeholders are people or institutions that see themselves as potentially affected by, or that may affect, an organization's activity. Early stakeholder mapping, in the scoping phase, is a useful tool to allow the company to gain an appreciation of who is interested and may be involved, how they may be involved, and the nature of the inter-relationships between stakeholder groups. Social analysis techniques and methods can be used in identifying stakeholders, their needs, aspirations and concerns regarding the project.

The type of data and information required to conduct a stakeholder analysis include household level socioeconomic data, information on ethnic mix and interactions, cultural traditions, gender profile in socioeconomic activities, existing mechanisms for decision-making, and past experiences with similar developments.

In identifying stakeholders, it is advisable for companies to be as open and inclusive as possible, involving all those that want to take part. However, stakeholder involvement is a dynamic process: some stakeholders may disengage over time, and others may join at a later stage of the project development. Therefore, stakeholder mapping is not a finite process, and is likely to continue beyond the scoping phase and throughout the life of the project. For more on stakeholder involvement, see chapter “Closure of site” pp 29 - 32, of these guidelines.

Land use

Cement facilities can cover areas of land ranging from hundreds to thousands of hectares, and are

usually located near existing infrastructures for the transport of products, and near deposits of raw materials. The most important issues regarding land use are:

- > **Land use planning.** Many of the areas in which the cement industry seeks to operate have relatively intact undisturbed ecosystems. There may also be demands for alternative land uses from local people. An integrated approach to land use management is needed that recognizes these potentially competing interests and negotiates the most appropriate action, bearing in mind the ecological and social limits of the area.
- > **Land tenure** is often a mix of formal legal components and informally accepted practices. Traditional tenure systems, especially of communal lands, may cause difficulties to industrial development or quarry operations (e.g. where land titles are barely defined and people obtain land rights simply by occupying and using common land, there may be conflicts between what is strictly legal in terms of tenure rights and what is locally considered legitimate).
- > **Compensation.** In some countries, the poorest people rely on subsistence agriculture for consumption and exchange. Simply providing cash compensation for the purchase of the land necessary to the cement industry may increase local dependence on the cash economy and imported food and become a serious threat to the well-being or even the survival of local people. In addition, compensating individuals for the loss of individual property rights may not compensate the community for collectively held interests (e.g. damage or alteration of the natural environment, social and cultural disruption, etc). It is therefore essential to consider the provision of adequate land, infrastructure and other additional compensation measures.
- > **Governance.** An appropriate governance structure is needed to ensure that land use decisions do not harm the inhabitants of the land and the environment, while still enabling appropriate development to take place. Agenda 21 states that: "governments at the appropriate level, with the support of regional and international organizations, should ensure that policies and policy instruments support the

best possible land use and sustainable management of land resources. They should (inter alia) develop policies that encourage sustainable land use and management of land resources and take land resource base, demographic issues and the interest of local populations into account".

- > **Infrastructure.** The infrastructure will be heavily affected by the transport of large quantities of raw materials for cement production, cement products and energy supply (by road, railway, through channels and harbors). Effective assessment will need to be made of all the existing infrastructure and present uses, planned improvements (if any), and the improvement / modification required by the proposed project.

Social structure and population

The ESIA will require initial data collection at the scoping stage on the size and social structure of the local population, and assessment of the groups expected to benefit directly or indirectly from the project: their needs, their demands, their ability to deal with change, the existing human capital in the form of education and skills and the potential for improving that, gender issues, and vulnerable groups, and the need for measures of mitigation, offset or compensation.

The most crucial stage of a social analysis is during the project feasibility study when all relevant social dimensions of the proposed project are examined thoroughly and incorporated into project design. A main feature of the social analysis will be the recognition that poverty reduction is the overarching goal for some countries and that there is a close interrelationship between poverty and the state of the environment. For example, the establishment of large industrial plants, such as cement factories and the inception of mining operations, may introduce significant changes in the use of land, water and other natural resources and may have adverse social and economic impacts on local people currently using those resources.

A proposed cement facility may require displacement of people. If displacement is unavoidable, a detailed resettlement plan with specified time-limited actions is required. Monetary compensation alone for land and displacement

may not be adequate, and resettlement plans should be built around a development strategy which includes various compensation measures, and be designed to generally improve (or at least restore) the social and economic base of those to be relocated.

Adequate resettlement planning may increase the initial investment costs of the project, but there will be long-term benefits including fewer delays and cost escalations during project implementation, reduced welfare costs to society and increased benefits from economically productive resettlers.

Public health

The ESIA will need to address local public health impacts, especially in developing countries. Health profiling of the local population can be done using frameworks based on Health Impact Assessment procedures (HIAs). HIAs are "a combination of procedures or methods by which a policy, program or project may be judged as to the effects it may have on the health of a population" (WHO 1999). HIAs seek to predict the health impact of a policy, program or project (including a development) usually before implementation, and ideally early in the planning stage. They aim to facilitate the reduction or avoidance of negative impacts on human health and enhance positive impacts.

Profiling identifies the key aspects of the population's health status, particularly those factors that may be susceptible to change or that may act as indicators of anticipated health impacts. It provides a baseline against which potential health impacts can be assessed.

Information for profiling is likely to include:

- > Characteristics of the population covered (e.g. size, distribution, age and sex, birth rate, ethnicity, etc)
- > Health status of the population (e.g. mortality, disability, morbidity, chronic disease), particularly of at-risk groups (e.g. young, elderly and/or poor people)
- > Health behavior indicators (e.g. rates of alcohol use and alcohol-related harms)
- > Locations where at-risk groups may be concentrated (e.g. particular localities, schools, child care centers, nursing homes, facilities for elderly people, etc)
- > Other social and environmental conditions.

The 'local' population that needs to be considered may be defined in various ways. If the community is small it may be simplest to profile the whole community. Alternatively, only the part of the community near the site, the quarries or a transport route may need to be profiled, or some other community that defines itself as having an interest. The boundaries identified and the reasons for their choice should be explained by the proponent of the new project.

Health (or illness) data may be available from local authorities, the relevant health authority or other government agencies. A reasonably clear picture of the health status, needs and potential vulnerabilities of the local population should be possible, provided special local factors (such as those outlined above) are taken into account. If not, the proponent should discuss the level of detail required for the profiling phase further with the local health authority.

Biodiversity and ecosystems

Biological diversity (biodiversity) means the variability among living organisms from all sources, including the ecological complexes of which they are part, and the diversity within and between species and of ecosystems (as defined in the Convention on Biological Diversity). Biodiversity supports soil fertility, water purity, regulates climate and provides 75% of the world's population with medicinal plants.

A significant proportion of the world's population, particularly poor and rural people in developing countries, directly depend on the surrounding area for subsistence and livelihood support (including food, building and clothing materials, animal foods and tradable products such as timber).

Biodiversity also provides less immediately obvious benefits, such as environmental services (being the medium through which air, water, gases etc are moderated and exchanged to provide such benefits as watershed protection, carbon absorption and storage, and nutrient recycling), and aesthetic benefits (such as unique species and special landscapes) which can also be associated with tourism. There are therefore close relationships between the environmental, social and economic implications of any impacts from the cement industry on biodiversity and ecosystems.

Habitats, wildlife and biodiversity conservation

Heidelberg Cement Group – Schelklingen cement works

Biodiversity and habitat conservation are key concerns at the quarries at Schelklingen cement works – the ecological value of these quarries have been found to be highly significant by several independent institutions (universities, nature conservation groups, independent biologists). A few of the ecological highlights are mentioned here. For more information, please visit www.heidelbergcement.com or read the article “Creating an idyllic nature site in a quarry – nature conservation and public relations as instruments of sustainable raw materials procurement” CEMENT INTERNATIONAL 06/2004 p. 108-115

- > **Endangered species**, such as the little ringed plover: This endangered species of bird originally lived on natural stone, gravel and sandbanks, but now relies on quarries and gravel pits to survive. Four to five pairs are breeding and regularly rearing their young in the quarries of Schelklingen.
- > **Rehabilitation**, including various methods of restoration and rehabilitation have been tried, and scientifically monitored – Schelklingen has a record of more than ten years’ sustained ecological research. Such methods include:
 - **spreading cuttings** (to re-colonize bare, dry rock devoid of humus),
 - **recultivation** (e.g.: planting hedges that are highly biodiverse and are hopefully encouraging partridge – a rare species in the region; and sowing a mixture of native shrub and tree seeds on the embankments, following the forestry authority’s recommendation) and
 - **natural succession** (which promotes the development of non-competitive plant species of the dry and semi-dry grasslands that can survive on dry and rocky environments).

The Convention on Biological Diversity recognized that protected areas are essential to conserve biodiversity. Protected areas are dedicated to the protection and maintenance of biological diversity and of natural and associated cultural resources, which are managed through legal or other effective means. The existence and the quality of management of protected areas are indicators of society's commitment to conservation, although conservation and the ecologically sustainable use of biodiversity cannot be confined to protected areas as much critical and valuable biodiversity is found beyond these boundaries. As the cement industry often occupies and modifies large amount of land with plants and quarries, boundary conflicts with protected areas can arise.

There are varying categories of protection. The IUCN guidance, based on six categories of protected areas, recommends no mining in categories I to IV (which constitute less than 4% of the Earth's surface), with some mining potentially being acceptable in categories V and VI, if compatible with the protected area objectives, subject to EIA and strictly controlled.

The types of data that need to be collected on biodiversity include:

- > Locations of protected areas
- > Locations of sensitive or important habitats or ecosystems
- > Distributions of protected species
- > Distributions of protected habitats
- > Experts in biodiversity, including taxonomic specialists / wildlife biologists
- > Uses of biodiversity resources (e.g. data, information, organizations, etc)
- > The geology and hydrology, soil quality, water resources and water quality, climatology and meteorology of the area.

It is likely that data will need to be collected over a long period, especially for the analysis of hydrology and meteorology, with the in situ collection and study of ecosystem data normally taking more than a year to cover seasonality.

The analysis is likely to cover an area larger than that directly occupied by plant and quarries because industrial and mining activity may generate both direct negative impacts, such as land take, loss of vegetation, noise, vibration, pollution,

etc., or indirect impacts such as microclimate variation, loss of food, and loss of animal and vegetal reproductive capacity.

The analysis will examine the biological and ecological values of the area (see Framework for integrating biodiversity into the site selection process, details in Appendix 1). The varying degree of sensitivity of these values that will affect the identification and declaration of:

- > highly sensitive and strictly protected core areas (that may influence decisions not to site or to site elsewhere);
- > buffer or intermediate zones in which, always subject to prior ESIA, less stringent rules apply; and
- > the areas where industrial and quarrying activities are more compatible with local ecosystems.

The biodiversity of certain limestone ecosystems may need special consideration during the analysis. Some limestone areas are significant in that they either harbor protected species (such as bats, orchids etc) or comprise caves that are best known as karst features. Karst landscapes are important archives of valuable information about past environmental conditions as well as historical evidence of human culture. Many karst areas are regarded as exceptionally beautiful and have cultural, archeological, palaeontological and geological value and importance.

Cultural heritage and landscapes

Cultural heritage can be defined as the present manifestation of the human past. It refers to sites, structures and remains of archaeological, historical, religious, cultural, economic or aesthetic value. Such value can be assessed using concepts such as 'cultural significance' and 'significance assessment' (World Bank; see Appendix 2 for definitions).

Similarly, human beings have created 'cultural landscapes' by domesticating the natural environment, particularly through agro-pastoral activity. Some such landscapes have been created for aesthetic reasons, such as gardens and parks. Others have a more utilitarian nature (e.g. cultivation) but may also be of a high aesthetic order. Yet others, such as mountains, lakes, cliffs or forests, have been imbued by human beings with a special spiritual meaning and reflect their

conception of the relations between humanity and nature and the gods. Cultural landscapes bear witness to humanity's creativity and imagination, technical, economic and social development, and cultural wealth.

As with biodiversity, cultural heritage and landscapes need appropriate site surveys, study and evaluation, carried out by specialists such as historians, archaeologists, landscape architects, etc. Also as with biodiversity, various levels of protected areas exist. If archaeological surveys are undertaken, these may require timetables ranging from a few months for a simple surface survey to a much longer period if more extensive archaeological excavation and classification of finds are required.



Conserving ancient kilns

Lafarge China, Dujian Yang, founded a museum to exhibit kilns dating back 800 years, discovered during earthmoving for a new plant.

Objective

To conserve and promote the archeological heritage discovered during earthmoving for a new plant in China.

Context

In 1998, Lafarge and the Chinese authorities began the construction of a model cement plant in Sichuan, a region in the heart of China which had only recently opened up to foreign investment. During the works, a number of kilns dating from the Song Dynasty (800 years old) were discovered.

Solution

The construction of the cement plant was interrupted. With the agreement of the local Relics Office, Lafarge made the decision to exhibit the kilns in a purpose-built museum located on the plant premises.

Results

After a five-month interruption to the works, the archeological treasure was preserved, restored and made available to the public in a dedicated museum.

Alternatives

The consideration of alternatives at the scoping and design stage, before any commitment to a particular action has been made, has to be integrated in a proactive way in the ESIA and provides the opportunity to minimize or eliminate the negative environmental and social impacts of the project. Alternatives may be considered at different times during the development of the project in the form of selection or elimination of first technical options and optimization of final engineering designs.

For the cement industry, the main alternatives concern location of the plants and quarries, and process options for the exploitation and transport of the raw materials. For the process design, best available techniques (BAT) for the cement industry may be used to identify the most suitable choices. Location alternatives are likely to include consideration of the presence of exploitable mineral deposits, of suitable infrastructure (energy, transport, etc.) and market demand.



Construction phase

Introduction

The construction phase of a cement plant and/or quarry, usually lasting two to three years, has the potential for a variety of positive and negative environmental and social impacts. The most important of these impacts are described below.

Environmental impacts

Traffic

In the construction phase of a cement plant and/or quarry, the transport of material for building usually generates environmental and social impacts. The principle negative impacts of transporting construction materials by road are:

- > Climate change impacts from emissions from vehicles using fossil fuels (as well as from other uses of energy from fossil fuels), and from clearing vegetation as a result of construction of roads etc;
- > Noise and ground vibration, dust and dirt, visual effects;
- > Potential soil contamination from fuels, oil, and other hazardous materials;
- > Potential health and safety risk due to increase in traffic and access to the construction site (if not adequately controlled);
- > Potential health impacts and nuisance factors due to noise, dust, vibrations, etc.

The diesel storage for heavy equipment may also generate environmental impacts unless special mitigation designs are adopted.

The potential positive impacts are primarily socio-economic in nature and may include:

- > Job creation and skills development, with associated increase in living standards;

- > Development and improvement of local physical and socio-economic infrastructure.

Some of the negative impacts of traffic in the construction phase are direct impacts of the project (e.g. noise generation, health and safety risks), while others are secondary impacts (e.g. nuisance to local communities due to noise). Many of the impacts also have the potential to combine with impacts from other activities that affect the same resources to cause cumulative effects (e.g. the clearing of vegetation can lead to cumulative fragmentation of habitats if other activities have similar impacts).

Potential traffic impacts should be discussed with local authorities. Any negative impacts may then be addressed by, for example, creating new roads and routing traffic away from sensitive areas, dust and emission minimization, speed controls, covering loads to reduce spills, and cleaning vehicles and roads.

Waste management

Waste produced during the construction phase of a cement plant and/or quarry exploitation process is primarily solid waste resulting from mechanical and electrical installation operations (e.g. creating visual impacts from the storage of topsoil and other solid wastes), and liquid effluents (e.g. possibly causing emissions and erosion problems).

On the positive side, the early establishment of a waste management policy and plans can provide a sustainable base for future operations on the site, and needs to take both hazardous and non-hazardous wastes into account.

Significant reductions in the need to dispose of waste materials of all kinds can be achieved by establishing an effective reuse and recycling regime, with the appropriate training to support it.

Waste management practices and requirements will vary from one location to another. The negative impacts of waste from the construction phase can be addressed by, for example, careful planning of the location of all types of waste to mitigate the negative visual impacts of the works, and the use of topsoil elsewhere (e.g. in quarry restoration). Liquid effluents can be managed by developing a site drainage plan to manage the flow of surface water and minimize the contamination of other water flows. Erosion can be minimised by, for example, replanting any exposed soils as quickly as possible.

Overburden

Two components of overburden result from the construction phase of a cement plant and/or quarry extraction process, both resulting from stripping operations before the development of the site: the soils (topsoil and subsoil), and other material surplus to requirements.

Soil and overburden management

South Africa has some of the toughest environmental legislation, and punitive damages have been required from directors and companies for environmental degradation.

Since the 1990s, Holcim (South Africa) Pty has run a program to manage soil and overburden for all their quarries. The program starts at the development stage and continues through to the quarry closure and rehabilitation phase. Newly stripped overburden is used to reclaim a recently exploited section of the quarry. Care is taken to match re-cultivation and landscaping with the surrounding landforms.

Costs for overburden removal are forecasted in the yearly operations budgets of the quarry. Separate financial provisions, based upon tonnes removed, are put aside into a trust fund which is externally and independently managed. During the quarrying scheduling phase, managers must request funds from the independent trustees based upon the targeted exploitation plan. Management cannot use the funds for any other purpose other than for overburden management through site reclamation. At the closure of a site, all remaining funds within the trust fund should be utilized.

On historical sites, which Holcim (South Africa) previously exploited and may not even own any longer, and where soil and overburden management was not performed, a risk assessment is prepared, resulting in a site restoration plan (if needed). A trust fund has been set up to deal with these historic sites (64 sites of this type have been identified to date).

Positive impacts of overburden may include the potential for selling it for use in agriculture, and in some cases using fine material from limestone quarries in carbonated fertilizers and in precast concrete.

The main negative impacts of the overburden generated during the construction phase are related to poor location of topsoil and other stockpiles which can affect the visual image of the site. The negative impacts may be managed by, for

example, using overburden at the quarry to construct anti-noise and dust barriers or screening mounds, in quarry restoration, in rehabilitating the plant area after construction, or for sealing and/or re-vegetating topsoil stockpiles and completed earthworks.

Social impacts

Transitory population increase

The potential for employment and access to new services may draw people to the area around a new cement plant and quarry. On the positive side, there may be a temporary increase in economic activity and employment for the local community, local skills development, and the possibility of increased funding for public infrastructure due to population increase.

Potential negative social and socio-economic effects may include the resettlement of local communities; an influx of strangers into local communities, disrupting social systems and community structures and affecting community values, family values and religion; increased demand on local services and infrastructure (e.g. by bringing in illness and disease); negative effects on community members if the increase in living standards due to job creation is not sustainable (e.g. where job opportunities cease after completion of the construction phase); and an increase in crime and deviant behavior (e.g. drug abuse, prostitution).

The negative impacts of temporary population increase during the construction phase may be managed by:

- > Employing engineers, construction workers and contractors from the immediate area;
- > Avoiding building permanent infrastructure which will not be used after construction;
- > Providing new amenities if the local infrastructure is inadequate;
- > Obeying the local customs of the area;
- > Avoiding using workers from different areas if that could result in clan, ethnic or religious rivalry.

Infrastructure

The construction phase of a cement plant and/or quarry exploitation will require both permanent and temporary infrastructure to be created, or use of the local community's infrastructure. The level of

infrastructure in the community should be assessed prior to developing new infrastructure. Key issues to be investigated will include the cost to the local community, compatibility with the community's existing infrastructure, the environmental and social impact of proposed infrastructure and the future use of the infrastructure after construction is completed.

The positive impacts of the development of the infrastructure may include providing aid to development in the community, and an increase in the standard of living.

The negative impacts of infrastructure development during construction may be managed by using infrastructure that can be easily dismantled after construction (if appropriate), and by developing or upgrading the infrastructure in ways that will benefit the local community (e.g. roads).

Health and safety

The construction phase may generate safety hazards in relation to increases in traffic and access to the construction site (if not adequately controlled), and potential health impacts and nuisance factors due to noise, dust, vibrations, etc. On the positive side, the implementation of general hygiene measures and general measures of safety can constitute a sustainable policy for the future, especially during the operations phase.

The project manager should take the necessary measures to avoid / minimize the negative health and safety impacts by, for example, training employees in off-road driving; acclimatization of workers, visitors and contractors in regions of high altitude, desert or humid coastal regions; ensuring awareness of hygiene, hazards in the local landscape (e.g. quicksand), severe weather conditions, on-site hazards (e.g. special equipment), and endemic diseases (including how to avoid and treat them).

Companies will need to comply with all international, national and local health and safety standards that may exist (see outcomes from CSI Task Force 3 on Health and Safety).



Operations phase

Introduction

The operations phase of a cement plant can be very long and often lasts up to 50 years (sometimes more). There is potential for both positive and negative impacts on environmental, as well as local and regional socio-economic, systems, including some cumulative effects.

The ESIA can provide a framework for the mitigation and management of adverse impacts throughout the cement production process, concentrating on preventative measures rather than mitigation or compensation measures whenever possible.

The true potential of any ESIA lies in the possibility for linkages with other tools of environmental management during the operations phase. In such an integrated approach, the ESIA will form part of a larger toolkit of instruments to achieve management of the potential environmental and social impacts of the project throughout the project life cycle. For example, linking the ESIA with an environmental and social management system will ensure that the ESIA findings become an integral part of the day-to-day management of the project, employing planned monitoring, review and corrective action activities to achieve continual improvement of the environmental and social performance of the project.

Social impacts

The social environments likely to be affected by cement plant and quarry operations include local people, their communities, their environment and their economy. Social impacts depend on the scale, location and components of operations, but can be

assessed by focusing on community well-being, which covers public health and safety, the living environment, satisfaction of basic needs, access to public services and landscape aesthetics.

There are likely to be both positive and negative social impacts on local communities from cement operations. Examples of potential negative social impacts include:

- > Additional pressure on the existing physical infrastructure (sewerage, water supply, etc.) and social infrastructure (health services, educational facilities, etc);
- > Impacts on the health of local populations;
- > Disruption to social networks due to influx of people;
- > Decline in community cohesion;
- > Increase in crime and deviant behavior (e.g. drug abuse and prostitution);
- > Changes in perceptions (e.g. of rich and poor); and
- > Changed cultural values.

On the positive side, cement companies may provide financial and in-kind support to local communities and disadvantaged groups (e.g. improved access for local communities to health care, education, skills development and training, sanitation and recreation). They may also provide infrastructure improvements including medical facilities, new schools, commercial, recreational and educational facilities, water supplies and public sanitation facilities. Planning to provide social benefits to local communities should therefore be an integral part of project management and engineering.

School Center

In 1998, Holcim's Colombian subsidiary developed a project to provide secondary education and agricultural training to children of local farmers, and promote environmental awareness and improvement around its cement facility in Nobsa. The project was driven by the local plant managers, who hoped to train the youth of the region so that they did not feel forced to leave.

With initial costs of approximately US\$ 220,000, and with the enthusiastic participation of the entire workforce, a school center (Centro Juvenil Felix Gloor) with a total floor space of 1,500 m² was constructed in 83 days.

Around 60 girls and boys from the local farming and mining communities in which Holcim Colombia is active now attend the school regularly. They are taught to use their country's resources in a sustainable manner and contribute to the well-being of their families and the region. Education and farming are the school's main programs.

The children live at the center from Monday to Friday. Each morning they are taught educational basics and the afternoons are devoted to agricultural skills at the school's farm, learning to grow and cultivate the produce needed to create self-supporting farms.

The center admits thirty children (aged 11 to 13) every two years, and the students graduate after six years. The center expects its first 30 graduates in 2005.

New jobs may be created and economic growth stimulated, and the growth of local business enterprises supported. Opportunities for growth and development are created through the attraction of supporting industries (e.g. vehicle maintenance services) and complementary industries (e.g. building material manufacturers). The local economy may benefit from the influx of capital and the increase in disposable income (from plant employees), both of which may be manifested in a multiplier effect in the local economy. As a result, the quality of the local labor force and standard of living may improve, as well

as there being greater social stability due to greater economic prosperity.

Contractors also have an important role to play, employing many people, providing housing and local retail services (e.g. food shops), purchasing locally, and developing local businesses. These benefits and opportunities will, however, need to be developed to reach their fullest potential (e.g. by helping local entrepreneurs to establish and run these services for local benefit).

The operations of a cement plant or quarry involve partnerships between the company and relevant stakeholders in order to negotiate and find common ground for the management of environmental and social issues. A cement company can understand community needs through such dialogue and can work with stakeholders to help meet expressed needs (e.g. infrastructure, job training, health care, education, nutrition).

Consultation with stakeholders and other proactive relationships can be valuable to cement operations and are worth pursuing as community support is critical and ideas and suggestions from stakeholders can be insightful and useful in improving a facility's operation.

Local partnerships with Habitat for Humanity

Lafarge Venezuela and Habitat For Humanity signed a cooperation agreement in October 2003 for the construction of 250 houses. The project is intended mainly for families affected by the 1999 Vargas tragedy (torrential rains fell on Venezuela and destroyed many villages). In line with the Habitat for Humanity principles, houses are sold at low price and without interest, and future owners contribute to the construction work.

Lafarge Venezuela and Habitat for Humanity committed to coordinate and organize the construction of 56 houses by the end of 2003, and 194 more during 2004. Habitat for Humanity will provide building counseling and advice, and Lafarge Venezuela will supply the cement needed for the execution of the project – for a symbolic price, thus reducing the cost of the houses.

In South Korea, the Lafarge subsidiaries concluded a sponsoring agreement with Habitat for Humanity Korea to supply all cement and gypsum for one year's construction projects. Lafarge Halla Cement provided 984 tons of cement and Lafarge Gypsum Korea 6,300 sheets of plasterboard for the construction of 40 houses. 80 Lafarge employees and their families volunteered to work on the project during the summer vacations.

In Romania, a five-year agreement was signed between Lafarge Romcim and Habitat for Humanity Romania. Lafarge Romcim agreed to make available financial support consisting of building materials and will encourage donations from subsidiaries. Teams of volunteers made up of Lafarge employees from all activities in Romania (cement, concrete and aggregates, gypsum and roofing) will be involved in building houses. The first mixed volunteers team worked in 2003 in Beius (Western Romania) to finalize two Habitat houses. The fifth year of the program (2006) will be devoted to building a house using exclusively Lafarge materials.

Occupational health and safety

Employee well-being requires consideration of the occupational health and safety of workers and contractors, workplace conditions (e.g. wages, benefits, security, rights and growth opportunities), as well as job satisfaction and pride.

The health and safety risks in a cement plant during operations include potential for respiratory diseases, burns, allergies and industrial accidents. Additional hazards can arise from the use of chemicals in the process and explosive materials used in quarrying activities (see box below). All such hazards can be successfully controlled by the adoption of safe plant methods, training programs and occupational health and safety management systems.



Security measures to reduce risks from explosives

There are particular problems in preventing accidents and reducing the dangers to safety from the use and storage of explosives at quarries. The cement company has a responsibility under the laws and standards of global and local regulatory regimes to take security measures to avoid any risk of the explosive materials used at quarries being taken for use in terror attacks and other crimes.

Particular issues to consider where explosives are stored on site are:

- > Managers of the storage and use of explosives need special training and qualifications (e.g. on law and regulations, the properties of explosives and their safe use and management to prevent accidents).
- > The storage of explosives at the quarry should take local residents and the local community into account. Explosives need to be kept in a locked storage facility, in an appropriate location, with the correct storage conditions (e.g. temperature, humidity, ventilation) and with clear notices providing warnings of the danger zone.
- > Managers of the blasting will want to consider fixing the number of workers allowed to work with explosives; ensuring there are always personnel available to keep watch; controlling flammable materials (including a ban on smoking) and prevention of static electricity and stray current; weather conditions (thunder, sandstorms, snowstorms, etc.); the transport and use of explosives.
- > Workers using explosives will require special training, and they should also be clearly distinguished from other workers (e.g. by wearing an armband).
- > Explosives used at the quarry should meet global and local safety standards covering both the ingredients of explosives and their quality of performance.
- > Careful records need to be kept, including of the storage situation and kind of explosives kept, the amount of storage and consumption, the consumption location, and the manufacturing date. There also need to be records of all deliveries and dispositions including every transport movement and return.

A system to measure, monitor and report on health and safety performance has been developed within the CSI (see outcome of Task Force 3), covering common definitions, reporting indicators, guidelines for occupational health and safety management systems and for general health.

In general, measures to avoid, minimize and mitigate the negative health and safety impacts of the operations of a cement plant may include:

- > Compliance to all international, national or local health and safety standards that may exist;
- > Training of all personnel in the use of protective equipment and chemical handling;
- > Clear marking of work site hazards and training in recognition of hazard symbols;
- > Training of all personnel in fire prevention and protection;
- > Regular noise surveys to ensure the on-site maximum levels are not exceeded;
- > Development of inspection, testing and maintenance programs;
- > Accident investigation and prevention initiatives; and
- > Development of and training in site emergency response plans.

Plant safety improved through cleanliness and landscaping

Cantagalo, Lafarge Brazil, found that the development of landscaped areas and the enhanced cleanliness of the plant could have a positive impact on safety performance.

Objective. To improve working conditions and safety performance and reduce particulate levels.

Context. The plant's overall appearance affects people's attentiveness to keeping the site clean. For example, leaks and other technical problems are detected and can be dealt with more promptly in a well-kept plant.

Solution. For over a decade, the plant has pursued a policy of Orderliness, Cleanliness and Housekeeping (abbreviated 'OAL' in Portuguese) that has proved highly beneficial to the image of the plant, the motivation of the workers and the safety statistics. The landscaping effort is part of the same policy, and the plant now employs

three people to maintain the grounds and gardens. Vehicle traffic over dirt roads was generating substantial quantities of dust, but now dirt roads are gradually being paved in an effort to control fugitive dust emissions.

Results. Cantagalo provides a good example of the correlation between plant cleanliness and safety. Most of the dirt roads are now paved, and the plant boasts more flowers than most other Group locations. The goal is for all surfaces in the plant compound to be one of two types: paved roads or landscaping.

Environmental impacts

The cement industry has reduced the environmental 'footprint' of its operations, but environmental challenges continue. For example, in certain regions, overall pollution levels may eventually exceed the natural capacity of ecosystems and cement plants (in common with other industrial developments) are likely to face increasingly strict emission controls.

Current options for controlling negative environmental impacts overall include management systems which cover monitoring of emissions, research on public health effects to allay concerns, technological improvements and process controls to reduce emissions. Best Available Techniques (BAT) should be used to avoid, minimize and remedy potentially negative environmental impacts arising from the operation of a cement plant. In addition, good management control, proper training of personnel, and optimized standard operating procedures (SOPs) often provide the easiest, most cost-efficient and most successful solutions to avoid, minimize and mitigate potentially adverse environmental impacts.

Meeting community challenges on environmental impacts

In 1997, in Croatia after the war with Serbia, RMC acquired an interest in a previously state-owned cement company, Dalmacijacement. The plant is on the Dalmatian Coast, a destination for tourists on the Adriatic Sea.

In 1999, when RMC acquired management control, it brought in a new Managing Director with a lot of experience of environmental and community matters. Within weeks of his arrival, a Croatian environmental group broke into the web site of another RMC business unit in a large western country. They did this to publicize the poor environmental record of a chemical (PVC) company some distance from the cement works and also to draw attention to other polluting sites in the locality. They linked several photographs including one of the main Dalmacijacement plant.

This action prompted the new Managing Director to investigate matters on his plants. He discovered a history of difficult communication between the previous management and the local community. He immediately implemented an open-door policy, inviting local decision makers, community representatives, and the media to discuss his plans for improvements but explained that they could not be carried out overnight. He said that his first job was to improve the plant's operation and cement quality so that the business would be commercially viable and jobs protected. Following that, he would address environmental issues. The community was not used to such an open approach, and they responded with support for the new manager. His approach improved the plant's reputation and further improvements have since been made to the environmental performance of the plant to the point where it was presented with an award in 2003 by the Ministry of Environmental Protection of the Republic of Croatia in public recognition of its four year environmental investment program.

Quarrying

Cement production involves the use of several quarried raw materials, such as limestone, clay, shale and gypsum.

Limestone is one of the key raw materials for cement production. It is widely available and is one of the most versatile industrial rocks, but extraction is likely to impact on environmental quality, biodiversity and landscape aesthetics. Some limestone regions are noteworthy for their highly characteristic biodiversity, unique fossil record or their importance as ancient and modern cultural heritage sites.

Elements of these biological and cultural resources have considerable economic value, particularly at local level. Therefore, environmental and social assessments should not overlook potentially unique biological, cultural, geological and scenic features when assessing the impact of quarry projects on limestone or other raw materials-source areas.

Some development activities may eliminate species and cultural sites and simple preventive steps can avoid this. For example, sites already disturbed, without caves or in a large connected area of limestone should be favored over untouched sites. More broadly, rational exploitation strategies should be developed within the context of regional inventories and assessments of limestone resources. There is also a range of management options, from reducing blasting impacts to restoring sites that can capture many of the original values of these areas.

Progressive rehabilitation throughout the life of a quarry will ensure that the residual impacts are kept to a minimum. Every effort should be made to reduce impacts on the surrounding area and create an ecological reserve to compensate for the area degraded. Possible measures to reduce the impacts of quarry operations include:

- > Establishment of a buffer zone to separate the mining activities from the surrounding area;
- > protection of any biodiversity rich areas;
- > On-site reclamation and rehabilitation;
- > Off-site rehabilitation and habitat restoration programs;
- > Increased worker and public awareness of biodiversity issues.

Creating an ornithological observatory

The Lafarge, Flicourt, France, quarry rehabilitation program includes the establishment of an ornithological observatory.

Objective. To restore a quarry as a wetland and build public awareness of the restored site's value in terms of biodiversity.

Context. Wetlands are natural ecosystems characterized by extensive biodiversity, especially migratory birds. In Europe, wetlands are seriously threatened by the drainage of areas for farming and urbanization, and also by water pollution. The rehabilitation of former alluvial quarries is an opportunity to re-create wetlands to promote biodiversity.

Solution. Lafarge developed a wetland at its Flicourt site and sought the support of the Greater Paris Parks Authority (Agence des Espaces Verts de la Region Ile-de-France) to turn it into a nature discovery facility open to the public. Specific features (such as resting perches, a variety of nesting habitats, reinstatement of vegetation indigenous to the Seine Valley) were included in the development in order to attract birds. Finally, two ornithological observatories were set up on the banks of a 7-hectare lake, where visitors can watch the birds without disturbing them.

Results. Today, the site is populated by 150 species of nesting and migratory birds and has been designated as a Zone of Community Interest for Birds (ZICO). Nature discovery activities are organized by the Greater Paris Parks Authority and a partner conservationist association. Thanks to the high quality of the rehabilitation program, the establishment of this protected natural environment has been successfully combined with the development of educational and learning materials.

The adverse landscape impacts of cement quarries can be minimized or eliminated, and there are many examples of advanced practices in quarry restoration and management that contribute to ecosystem and habitat protection, including monitoring methods employing specific indicators of biodiversity attributes. New quarrying techniques can also minimize dust and noise, such as computer aided techniques for deposit evaluation and the preparation of optimal quarrying schemes.

It is usual for companies' annual operations budgets to have specific allocations for quarry rehabilitation, during both operations and closure phases. The intended land use of the quarry after closure should form part of the planning process from the earliest stages, thus minimizing rehabilitation and reclamation needs at the end of its life.

Use of energy and raw materials

Cement operations require large amounts of energy and raw materials, and there is heavy dependence on fossil fuel energy (particularly coal and petcoke, fuel oil and natural gas for the kiln) and large quantities of limestone.

The amount of energy use varies for different kiln systems but, in general, electrical energy used for cement production constitutes approximately 20% of its overall energy requirements, with associated environmental impacts. The demand for electricity puts pressure on local electricity infrastructure, leads to increased air pollution (at the place of generation) and places further pressure on limited reserves of fossil fuels (depending on the method of generation). Fuel demands for the burning process places further pressure on non-renewable resources.

Energy recovery from rice husks

Lafarge Cement, Illigan, The Philippines, has found that rice husks are a novel and 'home-grown' substitute for conventional fossil fuels in the Philippines.

Objective. To reduce fossil fuel energy costs by substituting rice husks for conventional fuels.

Context. The limestone and other rock used in clinker production have a high moisture content and must be dried prior to grinding. The rotary dryer installation used for this purpose traditionally burns bunker fuel oil. In the Philippines, however, the major staple food is rice, which is grown extensively throughout the country. After the harvest, the grain is separated from the husk, generating a significant quantity of waste. Traditionally, husk disposal has meant uncontrolled open burning, leaving its calorific value untapped.

Solution. Lafarge decided to install an energy recovery system and utilize the energy from rice husks to fuel the rotary dryer. The farm co-operative collects rice husks in big bags (1 m³) for transport to the cement plant, where the husks are introduced directly into the flame of the rotary dryer. Rice husks are burned in place of bunker fuel oil.

Results. The process allows rice husks to be substituted for fossil fuel in a proportion of 35%, translating to a savings of 2 million liters of bunker fuel oil per year. Taking advantage of biomass energy recovery also decreases air pollution and greenhouse gas emissions by reducing the quantity of fossil fuel burned.

There are a number of options available for improving industrial ecology and resource productivity, including the development of products with lower material requirements, energy efficiency and conservation (e.g. waste gas from the kiln and calciner can be used for preheating the material feed), use of renewable forms of energy (biomass), effective reduction of waste, and more efficient quarrying.

Re-using unwanted waste is another way of reducing the use of non-renewable resources and cutting the costs of cement production (thereby increasing the competitiveness of products and services). It may also provide a waste management service for the local community and contribute to reducing greenhouse gas emissions (by reducing the use of fossil fuels). The use of waste as fuel in cement plants may also create opportunities for supporting businesses, as the preparation of different types of waste for use as fuel is usually done outside the cement plant.

Any use of waste in this way should ensure not only appropriate environmental protection but also the protection of human health and safety, for both the workers and for those living and working in the neighborhood around a cement plant. Use of any alternative fuels in cement kilns requires special provisions in plant operating procedures, staffing, and monitoring for worker protection, public health, and environmental quality. It also requires the development of emergency response plans and the involvement of the potentially affected community.

CSI Task Force 2 has developed principles to guide the use of waste in cement kilns alongside more detailed guidance on alternative fuels.

Improper handling of fuels and raw materials at cement plants may create health and safety risks for employees and the surrounding community. CSI Task Force 3 on Employee Health and Safety has developed principles for tackling health and safety issues. In the operations phase of cement plants and quarries, the following are relevant to the sourcing and use of fuels:

- > Design for safety (especially site suitability, layout etc.);
- > Risk assessment (including criteria for acceptance of risks and banning materials, and

- preventative checks especially of equipment);
- > Management systems (including an industrial hygiene program, an emergency plan, an audit system, documentation, communications and training).

Air emissions

An air emission is an air pollution with potentially harmful or nuisance effects on human beings, animals, plants, their biological communities and habitats, and the soil. Different raw material exploitation and preparation procedures create different sources of emissions in cement production, such as the quarrying and preparation of raw material, coal grinding, combustion processes, cement milling, packaging, and the storage, blending, transport and loading of dry material.

A monitoring and reporting protocol for cement process emissions has been developed by CSI Task Force on Emission monitoring and reporting.

Dust emissions

The main sources of dust from the cement production process are kilns, raw materials mills, clinker coolers and cement mills. In all these processes, large volumes of gases flow through dusty material. However, the design and reliability of modern electrostatic precipitators and bag filters ensure that dust releases can be reduced to levels where they cease to be significant.

Cement manufacturing involves the movement of dusty or pulverized materials from quarrying the limestone to loading the finished product for shipment, and fugitive dust emissions can arise during the storage and handling of materials and solid fuels, and also from road surfaces. Particulate releases from the packing and dispatch of clinker/cement can also be significant.

Control of dust resulting from hauling materials can be a difficult challenge and can be an even greater cause of air quality degradation than mill and kiln exhausts. However, the control and minimization of fugitive dust from cement plant operations need not require high cost technological solutions. Well-planned management of activities (e.g. in the methods of loading and material transfer) can reduce the generation of dust significantly, and with relatively little additional cost.

Options for controlling dust from other operations include the use of covered or enclosed conveyers, crushers, material transfer points and storage areas; installation of dust collectors and/or bag filters where needed; paved plant roads; vacuum sweepers for plant roads; sprinklers for plant roads and storage piles; latex stabilizing sprays for storage piles; and site landscaping and vegetation.

CO₂ and climate change

The cement industry is a large emitter of CO₂, the principal greenhouse gas. The industry produces 5% of global man-made CO₂, of which 50% is from the chemical process of clinker production and 40% from burning fuel. The cement industry recognizes that global warming is an important issue and that the industry shares in the responsibility for tackling the problem. Climate protection, and in particular reduction of CO₂ emissions, is therefore an issue which the members of the CSI take very seriously.

Three levers for improvement that can be applied in a cement plant have been identified:

- > Increased energy efficiency in order to consume less energy;
- > Using alternative fuels (e.g. biomass) to replace conventional fuels; and
- > Greater use of cementitious additions such as slag and fly ash

Quarry restoration with fruit-bearing trees

Cemex Espana was planting ornamental trees, mainly pines, around its quarries, but the trees were not thriving in the local climate (semi-desert). Cemex Espana decided to change the reforestation scheme and to use fruit-bearing trees instead, with excellent results.

Objectives. The original objective was to define a green belt around the plant and the quarries to improve the visual impact of the facilities, to reduce difficulties with the neighboring farmers, and to contribute to the reduction of the CO₂ emissions, by cultivating 150 hectares of trees.

Results. In addition to the expected results, the innovative system of reforestation turned the quarry into a productive fruit bearing plantation that generates employment for the local community and additional benefits for the plant. At the moment the reforestation program covers 118 hectares, with 10 hectares of plums, 38 of peaches, 36 of mandarins, 10 of almonds, 34 of nectarines, and 26 of vineyards.

The cement industry already contributes substantially to the reduction of greenhouse gas emissions by using alternative materials and fuels and has improved energy efficiency for many years (see also “Use of energy and raw materials” p 24).

CSI Task Force on climate protection, aims to improve the quality of public information available on the topic, particularly for companies working to manage CO₂ emissions accounting, emissions limitation, and emissions trading. The Task Force has produced and tested a detailed CO₂ accounting protocol, in association with the World Resources Institute. The protocol is an Excel spreadsheet to enable worksheets to be compiled, and is supported by a Guide to the Protocol (see www.wbcscement.org/pdf/co2-protocol.pdf).

Noise and vibration

The heavy machinery (crushers, grinding mills, blowers, compressors and large fans) used in cement manufacture can give rise to emissions of noise and/or vibration. Blasting activities in the quarrying process further contribute to high levels

of noise and vibration. The accumulated effects from various sources of noise and vibration can adversely affect the health and well-being of workers, as well as human, animal and plant species in the proximity of the site.

Mitigation measures to control the impact of noise include noise suppressors, regulation of distance between noise sources and operators, isolation of noise sources and the provision of ear protectors to employees working in areas where noise levels exceed noise limits. Scheduling of blasting activities to correspond with higher ambient noise levels can minimize the impact on local communities.

Solid waste

Waste produced during clinker production consists basically of unwanted rock and soil waste materials, which are removed from the raw materials during the preparation of the raw meal, and kiln dust removed from the by-pass flow and the stack.

Measures to avoid, minimize and mitigate the solid waste impact of a cement plant may include:

- > Recycling dust to reduce the volume of solid waste;
- > Incineration of waste materials in the burning process, where practicable;
- > Use of rock and soil waste material to backfill and rehabilitate quarries (where of a suitable quality); and
- > Disposal of material that is not suitable for burning or backfilling of quarries in an acceptable manner.

Storm water

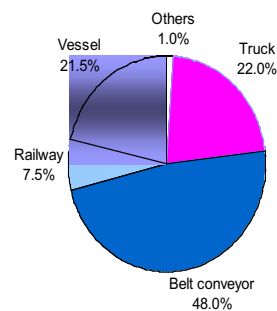
The impact of storm waters should be addressed using measures to divert the flow of surface water around the site and prevent the contamination of storm water (by pollutants, soil or any other material from the site) where necessary. It is also important to develop a site drainage plan to reduce storm water flow and sediment load before storm water is discharged from the site.

Traffic impacts

These arise from the transport of raw materials to the plant, and delivery of cement to customers. Similar impacts and inconveniences are faced as in the construction phase (see “Traffic” p 15 of these guidelines). The measures suggested for the construction phase should be carried forward to the operational stages and should be maintained as good practice.

Transportation of limestone from quarry to plant

In 2003, Japanese limestone production was 163 million tons. About half of all limestone transport from quarry to plant was by belt conveyor system, sometimes covering distances of more than 22km.



Belt conveyor installations can overcome complicated geographical features (e.g. using tunnels), and the natural environment can be protected from dust and noise by covering the conveyor with a box culvert.

Belt systems can contribute to the local community by reducing the traffic load and promoting effective land use. Compared to the use of roads, railway tracks or ships, belt conveyor systems are more economical, result in less fuel consumption and provide cleaner, more stable transportation under any climate conditions.

Major modifications

These can be defined as works, constructions, new equipment etc. that generate significant changes in operations, emissions, etc. Major modifications can have both positive and negative impacts, occasionally with cumulative effects. For changes with a BAT background the positive effect may be mandatory. A similar approach should be followed as has been described in the construction phase (above).

Monitoring and reporting

An Environmental and Social Management Plan (ESMP) can ensure that the commitments made in the ESIA, and in any subsequent assessment reports, together with any license approvals or similar conditions, are implemented. The ESMP should provide a framework for managing and mitigating environmental and social impacts for the life of a cement facility, and can be used to demonstrate that sound practices (environmental and social) will be followed throughout the establishment and operation of the facility.

The monitoring part of the ESMP is designed to determine the efficacy of mitigation measures and to verify predictions made at earlier stages of the ESIA process. The monitoring program should be designed to determine whether mitigation measures have been implemented in accordance with the agreed schedule and are working as expected, or whether it is necessary to introduce corrective measures. Various guidelines and legal requirements exist for the monitoring of different environmental aspects and/or impacts (see Appendix 1 for examples).

Monitoring can include:

- > **Baseline monitoring** which may be carried out over seasons or years to quantify ranges of natural variation and/or directions and rates of change that are relevant to impact prediction and mitigation (both environmental and social systems);
- > **Compliance monitoring** which aims to check that specific regulatory standards and conditions are met (e.g. in relation to pollution emissions; see guidance from CSI Task Force 4 on controlling emissions);

- > **Impact and mitigation monitoring** which aims to compare predicted and actual (residual) impacts and hence determine the effectiveness of mitigation measures.

Monitoring can aim to monitor conditions at the sources of the potential disturbances or at the locations of impact receptors. Impact monitoring is particularly relevant with regard to social impacts, as the cause of impacts is often not any single impact, but rather an accumulation of diffuse impacts. Examples of this type of monitoring include:

- > Social and community indicators (e.g. changes in quality of life, income levels, spending patterns, community health indicators, educational levels, family cohesion, etc.);
- > Surface and ground water availability and quality in specific receptors (e.g. water bodies on or near the site); and
- > Ecological indicators (e.g. indicator animal or plant species).

The monitoring of social impact variables is crucial to the success of the social assessment. Together with mitigation measures, monitoring can be used to manage the uncertainty associated with social impacts and their assessment.

Monitoring programs that involve local communities can be very successful. This requires that communities be supplied with the necessary resources to assume some of the monitoring and mitigation responsibilities.



Closure of site

Introduction

The decision to close a site (quarry or cement plant) is shaped by factors including the availability and quality of raw materials (including mining permits), production costs (including operational permits), competition, and market demand for cement. Site closure may include the total or partial cessation of operations (e.g. partial closure, reducing / downsizing operations, or mothballing).

The framework for deciding on the complete or partial closure of a site should be taken into account as early as possible in the development of the site (preferably at the scoping phase).

The actual closure process may take several years depending on local agreements and regulations, the size of the facility, etc. The social, environmental, health and safety aspects need to be addressed as well as opportunities for improvements, as outlined below.

Community and stakeholder involvement

Addressing the community's and stakeholders' needs in relation to the options for site closure is essential, and can avoid major delays which may otherwise result from protests and legal actions. Dialogue with stakeholders likely to be affected by the decommissioning of a plant can identify and address their needs and wishes, as well as discussing the environmental, social, economic and health and safety issues that may arise.

A socio-economic assessment should be conducted to identify possible impacts on the community and employees due to closure of the facility or site.

Future site use

As cement plants operate for such long periods, communities may grow up around the site. In addition, in some countries, the actual landholdings of cement plants and quarries are often greater than the affected footprints. When rehabilitated or redeveloped, land affected by cement quarries and production can become valuable, and unaffected landholdings may have become important reservoirs of the original flora and fauna.

The closure of a quarry can present safety issues. Prior to closure, a hazard assessment should be conducted to identify possible areas of concern which may impact on the safety of the community and employees, giving particular consideration to preventing uncontrolled access as well as potential exposure to any hazardous materials on site.

The options for the final use of the site will be heavily dependent on who owns the land, which may not be the cement company itself, and whether the owner has specific plans for future use.

If the property is owned by the cement company, a Future Site Use Plan can be developed with the close involvement of the local community, prior to the decommissioning of the plant. The Future Site Use Plan should take into account the amount of remediation and rehabilitation that will be required, and any development of the site that may provide the stakeholders with an agreed outcome (such as a sustainable source of employment and income) and be sustainable in the long term.

Future uses, especially of quarries, may include rehabilitation as nature reserves, as farmland, as woodlands, as wetlands or aquatic ecosystems, or the land could be developed for industrial or commercial uses, or for community use.

Community involvement in future site use

Debate about future site uses is commonly part of decommissioning a facility and active communications including stakeholder involvement can be critical in reaching a resolution. At their closed plant in Kent (South East England), RMC subsidiary Rugby Cement still owns the site, and meets with a community committee that cares very much about the future use of the site.

At another closed plant, in Chinnor in Oxfordshire, the situation of the Rugby Cement plant changed over time. Originally built away from a village, the village grew until it was directly next to the plant. In the past a relatively high proportion of residents worked at the plant, but this proportion has dropped and the village is now in the London commuter belt. Here the company wants to develop its land for a multiplicity of uses including residential, small-scale industrial and public amenity. It is working with representatives of the village to draw up redevelopment proposals.

Rehabilitation

Rehabilitation is the process by which the site is restored to a level which is both environmentally and aesthetically acceptable. The level of rehabilitation will depend on the future use of the site, regulatory considerations and the wishes of the landowner (see 6.3 above).

For quarries and cement plants, rehabilitation should be a continuing process throughout the operations phase, and might include decommissioning plant equipment for redeployment or resale as scrap, or reuse or demolition of disused structures. In certain cases, at the end of the operations phase, rehabilitation could be considered for the whole area covered by the cement manufacturing footprint.

Prior to site rehabilitation, a hazard assessment should be conducted to identify if and where hazardous materials are located and were historically used, and which areas have suffered localized spills and other contaminations (e.g. underground storage tanks and materials containing asbestos). People working on site rehabilitation should be adequately trained and protected from hazardous substances.

There will need to be extensive involvement of the property owner (if the property is leased), and rehabilitation plans need to be developed in partnership with community officials and representatives. Practical work to rehabilitate the site (e.g. tree planting and ecological surveys) can provide educational opportunities for young people (e.g. through schools or clubs).

Rehabilitation of cement quarry

Previous situation. A Holcim Polpaico cement facility located in Cerro Blanco, Chile, was faced with the task of decommissioning and rehabilitating an 800 hectare quarry. The quarry, located in an arid desert region, was in use for 50 years and there were large areas of soil and biodiversity degradation.

The solution. A rehabilitation study was conducted in 1991 and was integrated into the company's strategic plan. The rehabilitation plan involves creation of green spaces, vegetation restoration, soil restoration, morphology restoration and slope stabilization. The main issues of the rehabilitation process have been water availability (drip irrigation), soil quality (increasing organic material and reducing alkalinity) and enhancing vegetation survival rate (use of xerophytes).

The quarry rehabilitation is taking place in three phases: phase 1 is a five-year program covering 160 hectares, phase 2 is a 15-year program covering 480 hectares and phase 3 is a 30-year program to totally rehabilitate areas affected by the quarry and cement plant. The rehabilitation program started in 2002 and so far four pit lakes covering 52 hectares have been rehabilitated into fields covered with native vegetation.

Employment

Due to the location of raw material deposits, cement plants and quarries may be developed in remote locations and may be providing the primary economic engine of a community or region through direct employment or through indirect job creation. Job loss is often associated with closure of a site.

Decommissioning plans should be fully evaluated to determine the magnitude of the social impacts of job losses on the local society and economy. Impacts can be minimized by relocating people to different sites or helping them finding jobs outside the company. If decommissioning results in a future use of the site which generates alternative forms of employment, the former employees could be retrained and offered jobs at the site.

In collaboration with local authorities, efforts should be made to minimize the effects of unemployment caused by closure (responsible exit). Assisting the community to develop other sources for employment and income will reduce the long term impact associated with decommissioning. For example, companies can help maintain the economic structure of a community by providing support which can be used to promote sustainable local business activities and alleviate job losses associated with the site closure.

Responsible restructuring

In 1998, the Holcim Lanka (Sri Lankan Group) company was hit by a heavy market downturn due to ongoing political conflict and civil unrest in the country. Holcim Lanka needed to downsize considerably at the plant in Puttalam, with about 400 employees from a workforce total of 1,000 losing their jobs. The company was committed to supporting redundant employees in a way which exceeded national laws. Specifically, it wanted to ensure that those retiring earned a reasonable monthly income as well as guarding against the potential squandering of compensation payouts.

Employees were offered a voluntary early separation plan, which included the option of starting their own small business. To facilitate this, a partnership was formed with two other organizations: Sri Lankan Small Business Center (SLSBC) identified promising entrepreneurs and trained them for their new ventures, and Hatton National Bank offered low-interest loans. The company's role was to facilitate the process and to maintain close communication with all new entrepreneurs.

A project manager supported the new businesses during the difficult start-up phase, until they reached self-sufficiency. Maintaining the partnership between the organizations and small businesses, and ensuring that the services of SLSBC and the bank remained continually available, were important to the project's success. A network among the entrepreneurs was also established.

About 270 employees accepted the voluntary early separation plan and the additional support to set up their own businesses. By 2002, 261 entrepreneurs were still in business and more than 60% had a better income than during the times they had worked for Holcim Sri Lanka. And the benefits extended further. Businesses were established throughout the island, providing better services and products to their local communities including fruit and vegetable farming, engineering services, clothing factories and shops, transport services, grocery stores, bakeries, bicycle shops and others. This approach to restructuring has since been applied by other Group companies.

Social structure

Cement plants and quarries have long operational life spans (up to 50 years) and can have a stabilizing effect on the social structure of neighboring communities through job creation, social projects and both direct and indirect community involvement.

In planning the closure of a site, the overall existing social structure should be assessed to determine the effect decommissioning would have on the surrounding community, including as a result of the loss of support from the company for social projects (e.g. community health centers, fire and emergency services, training centers, child care facilities etc). Grants or other arrangements with local authorities to help maintain any critical services identified in the assessment to help minimize the impacts of site closure could be explored.

Post closure monitoring

Chrome bricks, cement kiln dust, bypass dust, etc may have been disposed or stored on the site in the past. Post closure monitoring is required to measure resulting diffuse low level contamination in soil or ground water. Substances such as heavy metals and organics are commonly monitored in ground water and soil after closure in accordance with local regulations.

In some places, there are legal requirements which govern the period of time over which monitoring needs to continue (e.g. in the UK, under EU liabilities regulations, monitoring must continue for 20 years). However, cement companies will need to know the extent of their long term potential environmental impacts wherever they are located.

Post closure monitoring can be planned through a stakeholder dialogue process involving environmental agencies, public authorities, community representatives and other stakeholders. Monitoring can then demonstrate that the site has been rehabilitated or is in a state which poses little or no threat to human health or the environment.

Planning and helping implement end of life monitoring can be a learning experience for all stakeholders to increase understanding of potential health or environmental risks in relation to future land use options.





Mitigation

Introduction

Mitigation measures aim to remedy or compensate for the predicted adverse impacts of the project on site. Following impact evaluation, mitigation options can be developed within the framework of the hierarchy 'Avoid – Reduce – Remedy – Compensate'. Offset has similar aims but action to reduce or remedy harm is focused off site. Mitigation and offset measures should therefore form part of the scoping, design and planning processes for cement operations. The European Commission (2000) provides useful advice on best available techniques (BAT) for environmental impact minimization in the cement production process.

Mitigation

Mitigation is both a very important principle and practice. It means that companies do their best to reduce, neutralize, and repair the impact of their activities on people and the natural environment.

All mitigation efforts should focus first on how to avoid social and environmental impacts in the initial stages of planning. This has much greater beneficial effect than remedial action later.

Many social and environmental mitigation measures will be in response to legal requirements. However, in many situations companies will have a business case for going beyond compliance and will want to demonstrate more advanced mitigation to meet stakeholder concerns, with long term results and benefits.

Mitigation measures will include those planned and implemented before, during and after starting a cement project. These measures should have goals and targets set well in advance, and the extent to which these are being met should be monitored on a regular basis.

Mitigation of social impacts

Social impacts relate to the health and safety not only of human communities near to a site, but to those which may be some distance from it. For example, the site could affect water supply which could impact on people and their livelihoods many miles away from an operation who are relying on clean and potable water. This means that in planning mitigating action, these watershed (and other spatial) issues must be taken into account. The close links between socio-economic and environmental contexts for mitigation procedures are clearly demonstrated by this example.

Other health impacts of cement activities are associated with atmospheric emissions (primarily dust, which can affect people's health directly) and impacts on soil (which can affect people's ability to grow food).

Community well being and environmental integration

The Italcementi Group Agadir cement plant was brought into service in 1952 with a modest capacity of 60,000 tons per year, gradually increased to reach 1,000,000 tons today. Located in what was originally a rural area, the cement factory became included in the ever expanding urban area. Since 1991, the cement factory has set up a significant program to improve the cement plant's environmental and social impact on the neighboring community. Actions taken include:

- > **Environmental integration of the cement plant**
 - Separation of the access way to the clay quarry from the neighboring village by means of a new track and improving access to the village itself
 - Widening of the national road running beside the cement plant and creation of green and pedestrian areas
 - Settlement of the slope behind the plant and reclamation of the quarry overburden
 - Improvement of aesthetic aspects of the plant
 - The plant management holds regular meetings with the local authorities and public agencies and has signed several agreements dealing with environmental protection, such as for the use of sludge from the water treatment station of ONEP (Office National de l'Eau Potable), with the Veterinary and Agricultural Institute for tree planting, and with the Municipality of Agadir, the Delegation for Teaching, and the Regional Association for Tourism for burning plastic bags in the cement plant kilns.

- > **Potable water supply.** For more than 50 years the Agadir cement plant has been supplying the neighboring village with a daily amount of potable water that has reached 200 m³ per day in the last ten years. To enlarge drinking water availability, CimENTS du Maroc provided financial support for the construction of a 4,000m³ capacity tank and 4,000m long water supply pipes.
- > **Installation of a seawater desalination plant.** Given the problems of lack of water in the Agadir area, and in order to keep existing resources mainly for domestic use, CimENTS du Maroc has built a 1,000m³ per day seawater desalination plant. It is expected that this plant will be a model for developing this technique, which the area will certainly require in coming years.
- > **Rural women integration and alphabetization program.** Since 1999, CimENTS du Maroc has helped create two tailoring training centers in partnership with local authorities and NGOs. The centers promote the integration of rural women into wider social life and have sponsored the Zakoura Foundation which funds some schools for the young people alphabetization program.

In considering mitigation strategies, assessments should also be made of other impacts relating to disturbance, including noise levels and vibration, both of which can cause a range of health problems. In addition, there are issues of physical risk for members of the public with legal, or illegal, access to the site.

Mitigation of environmental impacts

The principle of early advance planning and avoidance of problems (rather than dealing with problems when they arise later) relates as much to the alleviation of environmental as to social impacts, especially in relation to nature conservation.

All companies have an over-riding responsibility to know which land is formally protected under international frameworks such as the IUCN / World Conservation Union's categories, other categories of regionally (e.g. under EU legislation) and locally protected sites, and increasingly under national or local Biodiversity Action Plans.

There is much debate on the legitimacy of land substitution as a mitigation measure. Land substitution involves allowing extraction on land of high conservation value (e.g. species rich grassland, lowland tropical forest, or an area important for large congregations of birds) for which a company has or seeks extraction rights, in exchange for the company releasing another area for protection. **The fundamental principle of substitution is that there should be no net loss of biological value in terms of biodiversity and numbers of wild animals and plants.** This means that a mitigation strategy based on substitution should result in either a neutral, or positive, situation for biodiversity.

Mitigation banks represent another form of substitution in which companies buy land to 'store' to offer in a future land substitution arrangement with government or an NGO in the event that the company wants to develop a particular site. Again, the land held in the bank should be of equivalent or greater conservation value than that being used for development.

Offset

An 'offset' is action taken outside, but near, a development site to balance negative impacts. The developers may either take the action themselves or pay for others to do it on their behalf.

While offsets are simple in concept, offset schemes must be carefully designed to ensure their full beneficial potential is achieved in practice.

Principles for offsets

The Australian Environmental Protection Agency has developed some principles for environmental (or 'green') offsets:

- > Environmental impacts must be avoided first by using all cost-effective prevention and mitigation measures. Offsets are then only used to address remaining environmental impacts.
- > All standard regulatory requirements must still be met.
- > Offsets must never reward ongoing poor environmental performance.
- > Offsets will complement other government programs.
- > Offsets must result in a net environmental improvement.
- > Offsets must be:
 - enduring: they must offset the impact of the development for the period that the impact occurs
 - quantifiable: the impacts and benefits must be reliably estimated
 - targeted: they must offset the impacts on a 'like for like or better' basis
 - located appropriately: they must offset the impact in the same area
 - supplementary: beyond existing requirements and not already being funded under another scheme
 - enforceable: through development consent conditions, license conditions, covenants or a contract.



Stakeholder involvement

Introduction

Understanding the needs and expectations of stakeholders is a fundamental first step in working effectively with local communities, and with others, on issues affecting local communities. There are some guiding principles for identifying and working with stakeholders (outlined below), but each local context is different, and each local community will have different priorities and expectations.

Stakeholders in the cement industry are all the individuals and groups who see themselves as potentially affected by, or who may affect, cement operations at the local, national or international scale. These include, but are not limited to, local public and government authorities, neighbors, community organizations, employees, trade unions, government agencies, the media, non-governmental organizations (NGOs), contractors, suppliers and investors.

Stakeholder mapping can be a useful framework for identifying who has an interest, and what their concerns may be. Primary stakeholders may be identified as those on whom the project will **impact** whether positively or negatively (primarily the local communities which have land tenure and land rights) and those groups or organizations that can impact on the project. Indirect stakeholders include those with specific **interest** in the project, those who have programs that relate to regional planning or improvement and those who have concerns in the issues at hand, such as pollution, landscape, biodiversity, etc. (See also “Stakeholder mapping p 9)

Why involve stakeholders?

The beliefs and actions of stakeholders can have a direct impact on the operations of the cement facility. Communicating with and involving stakeholders is often required to ensure a stable relationship between a plant and the adjacent community. The more active a facility is in involving stakeholders and understanding their concerns, the more time a plant has to consider this feedback in making critical decisions.

When communication and stakeholder involvement is nonexistent or reactive, the results can include long court battles, demonstrations of protest at the gates, boycotts, environmental damage and facility closures. An active approach leads to decision processes that generally proceed with less difficulty and greater benefit for everyone involved.

In the experience of the cement industry, neighbors and other stakeholders respond positively to citizen advisory or community liaison committees, clarity of information, honest environmental reporting on performance measures, plant open days, pollution prevention initiatives, and well-designed environmental restoration projects. Collaboration between the community, regulators and industry improves both facility performance and living conditions for all involved.

The costs of NOT involving stakeholders

Dr David Evans, Technical Manager from RMC's Rugby Cement unit in the UK, admits that a crisis resulted from making a decision to burn a hazardous secondary liquid fuel in the early 1990s at its plant in Barrington, near Cambridge, and not thoroughly discussing it with the community.

Rugby Cement did not anticipate the strength of the local reaction and therefore did not allocate sufficient resources in advance to consultation and communication. A 90-year good working relationship between the company and community dissolved overnight. Dr Evans estimates that he spent the majority of two years trying to re-establish this relationship. The costs to the company included his salary, countless time of other staff to meet with a range of stakeholders, and the costs associated with hosting numerous public meetings, developing press releases and other media announcements.

One outcome from this effort was the creation of a community liaison committee that included the citizens who were the most vociferous about the decision to burn alternative fuels. The company and regulators now use this committee as a sounding board before making any major decisions. After five years, trust has been re-established, and Dr Evans and his colleagues believe they have learned a great deal from this experience.

There are costs associated with these activities. However, costs to the company can be even greater if stakeholders take action against the company. Being aware of the issues and stakeholder concerns, and working to resolve them early before they become negative actions, is time and money well spent. More positively, ideas and suggestions from stakeholders can often be insightful and useful in improving a facility's planning and operation. In this way, stakeholders may be seen as consultants to a company.

Community Advisory Panels

Holcim (US) Inc. established its first community advisory panel (CAP) ten years ago. It now leads the American cement industry in this area.

The Holly Hill plant in South Carolina provides a good example of a CAP in action. In 1994, a cross-section of community interests was invited to come together to discuss key issues surrounding the use of waste materials as fuel in the kiln. The establishment of the committee - its method of operation, decision-making processes, facilitation options, length of tenure and so on - was decided by the committee members themselves. The panel provides the company with valuable insights into the concerns of the local community.

Six years on, the panel provided a perfect sounding board for Holcim US when a plant expansion was proposed. It assisted with identifying and understanding issues of concern to the community, and provided a reality check for plant management as it sought wider support for its plans. The members of the panel in effect acted as ambassadors for the plant, and helped provide a community base of support for the expansion.

These panels are a voluntary and proactive initiative, not required by any permitting process. Until recently, the program focused only on plants using alternative fuels and raw materials. However, the benefits of the process had encouraged Holcim US to establish CAPs at all its cement plants by the end of 2002.

Levels of communications with stakeholders

Communications between cement companies and stakeholders can take many forms. The International Association for Public Participation proposes five main levels of communication: Inform, Consult, Involve, Collaborate and Empower. The Battelle / ERM Guidelines for the cement industry propose five similar levels of communication, each leading to greater sharing of information and better understanding of stakeholders and their issues:

- > **Ad hoc communication**, which happens whenever an opportunity occurs. In such cases, some information is transferred but the exchange is informal and the information not comprehensive.
- > **One-way communication** covers activities such as distributing leaflets, letters or doing presentations with no opportunity for questions or discussion.
- > **Two-way communication** involves an exchange of information and ideas between stakeholders and the company.
- > **Stakeholder involvement or stakeholder dialogue** is designed to develop better understanding between the company and stakeholders, and can lead to knowledge being gained by both. One major difference between stakeholder involvement and a conventional public relations campaign is the commitment from the company to consider and incorporate feedback from stakeholders. That does not mean accepting all stakeholder suggestions, but does mean that stakeholders know that their suggestions have been thoughtfully heard and considered.
- > **Participatory or interactive decision-making** occurs when companies work collaboratively with stakeholders to make decisions. Shared decision-making is not appropriate in all circumstances but can be effective in helping a company design a plan that, when implemented, will be acceptable to its stakeholders.

Principles of stakeholder involvement

The basic principles are:

- > **Voluntary involvement.** Everyone involved should be committed to progress and full participation.
- > **Openness, honesty, trust.** Open and honest communication is a requirement for mutual trust.
- > **Inclusiveness.** Strive to include all interested parties in some form of dialogue, recognizing that the same methods and levels of involvement will not be appropriate to all stakeholders.
- > **Common information base.** Participants should have access to the same information.
- > **Mutual learning.** All parties, including the host and stakeholders, should come to the discussion with a willingness to learn.
- > **Creative options.** A diverse set of stakeholders can act as a catalyst for creative thinking.
- > **Collaboration in decision-making.** Building ownership is likely to increase the potential for effective implementation and future collaboration.
- > **Co-ordination of stakeholder feedback.** Be clear, and communicate, how you will use stakeholder feedback.

Developing positive community relationships

The RMC Rugby Cement Barrington cement works were first developed at Barrington, UK in 1912 by Dreadnought Portland Cement Co. Ltd and were acquired by RMC Group plc in January 2000. The site operates one wet process kiln and one two-chamber mill. Predicted reserves at the on-site quarry exceed 70 years in total, with 450,000-500,000 tonnes of raw material quarried annually. The population around the local area is a mix of rural workers and academics. Before the 1990s, the level of acceptance of the facility was generally high, but when the company introduced alternative fuels to replace fossil fuels, the community protested. After initial communications were not successful, the community formed a pressure group called Camair.

Over a period of time the company created a liaison committee (with government, company,

community and pressure group members) and, after an initial confrontational meeting, the group has been working well and typically meets quarterly. The plant is now actively involved in the local community: sponsoring local events; funding a monitoring station for air quality control; and holding both site visits and one-on-one sessions on a range of issues. Meetings, particularly through the liaison group, are the key form of contact, and there are also open houses, telephone calls, letters, public question and answer sessions, and the public register is also used to share information.

Environmental concerns were high on the agenda, particularly the large use of alternative fuels and resulting environmental consequences (e.g. air quality and environmental pollution).

Other environmental concerns related to the impact of noise on the local community (as a result of traffic activity on local roads), dust plumes, landscape restoration, the potential for waste dumping in the quarry holes left post-extraction, and the detrimental aesthetic impact of the site on the landscape. Health issues remain a concern.

The relationship has evolved from one of confrontation, characterized by a lack of trust, towards a much more open relationship. The company has significantly developed its communication techniques to include opportunities for local stakeholders to contribute to discussions and planning for the future development of the facility. Overall, the current situation was felt to be preferable to experiences in the past because the personal meetings gave the stakeholders the feeling that their views were being heard and responded to in a more personal context (even though sometimes belatedly). Community suggestions for the future include improving the quality of data presented, using performance indicators for comparing quantitative data, and developing a website to allow for more direct access to information.

Six steps to stakeholder involvement

In developing a general approach to stakeholder involvement, and a plan of action, it is essential that the company has a clear understanding of its objectives in working with stakeholders, has a reasonable timescale for involvement, is prepared to find the necessary resources (including for independent facilitators if appropriate), is willing to work with stakeholders to find mutually beneficial outcomes, and is prepared to accept that even the best engagement process may fail to achieve consensus.

There are six basic steps in planning for stakeholder involvement:

- > Establish an involvement team and plan;
- > Identify the appropriate stakeholders (see above and section 3.2 for stakeholder mapping);
- > Define the objectives / intent of the involvement exercise;
- > Inform staff;
- > Involve stakeholders;
- > Respond to stakeholders, and feedback to the main planning process.

Communication and stakeholder involvement should be a continuous activity at facility level, and then augmented during periods of change or crisis when major decisions are being considered.

Appendix 1 - References

Scoping / Greenfield site assessment

Introduction

For screening refer to European Commission Guidance on EIA, Screening, June 2001:
<http://europa.eu.int/comm/environment/eia/eia-guidelines/g-screening-full-text.pdf>

For scoping refer to European Commission Guidance on EIA, Scoping, June 2001:
<http://europa.eu.int/comm/environment/eia/eia-guidelines/g-scoping-full-text.pdf>

Stakeholder mapping

Communication and Stakeholder Involvement. Guidebook for Cement Facilities. Battelle Memorial Institute and Environmental Resources Management (ERM) Ltd. www.wbcscement.org

Asian Development Bank Environmental Assessment Guidelines, Technical Guidance, 2003
http://www.adb.org/Documents/Guidelines/Environmental_Assessment/eaguidelines010.asp

International Institute for Environment and Development, MMSD Working Papers, Developing New Approaches for Stakeholder Engagement in the Mineral Sector, May 2002.
http://www.icmm.com/publications/153mmsd_au_stakeholder.pdf

Land Use

http://www.natural-resources.org/minerals/CD/docs/mmsd/global/finalreport/finalreport_07.pdf

Social analysis

For guidance on links between EIAs, social analysis, resettlement etc, see:
<http://www.oecd.org/dataoecd/37/27/1887708.pdf>

http://www.adb.org/Documents/Guidelines/Environmental_Assessment/eaguidelines010.asp

Public health

Health Impact Assessment Guidelines, enHealth Council, Australia, September 2001
http://enhealth.nphp.gov.au/council/pubs/pdf/hia_guidelines.pdf

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Closure of site

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End of Life Monitoring

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Appendix 2 - Glossary

Advisory panel

Usually consists of selected individuals, chosen to represent stakeholders, who meet periodically as a group to assess results and advise on future activities.

Alternative fuels and raw materials

Secondary fuels or raw materials derived from by-products of other industrial processes which provide either energy or minerals for the cement manufacturing process. Used to supplement or preserve traditional fuels and raw materials.

BAT

Best Available Technologies / Techniques, including mitigation technologies which have been evaluated by both external and internal experts as best suited for the cement manufacturing process. Also an industry specific document produced in response to the EU's IPPC Directive.

Biodiversity

The number and variety of organisms found within a specified geographic region. Also defined as the variability among living organisms on the earth, including the variability within and between species and within and between ecosystems.

Community involvement

The act of involving the community (however defined) in the decision making process in order to reach a desirable outcome which benefits both the community and the company.

Cultural significance

The World Bank's guidance on Cultural Heritage in Environmental Assessment defines 'cultural significance' as a concept in estimating the value of a site. Sites that are likely to be significant are those that help our understanding of the past, or enrich the present, and that will be of value to future generations.

Cultural significance can be assessed in different ways and with varying scope (see also Significance assessment, below). The process may be informal and rapid or it may be a formal process that requires specialized expertise (such as archaeologists, legal specialists, anthropologists and botanists). It may deal with an individual site

or be part of a regional or local overview. The appropriate level of detail will vary according to circumstances, but is likely to include aesthetic value, historic, scientific or research, social, economic and amenity value.

Decommissioning

The cessation of operations of a cement manufacturing site. May include demolition and reclamation and/or redevelopment of the site.

Greenfield sites

Areas of land which have not previously been developed beyond agricultural or forestry use.

Health Impact Assessment (HIA)

HIAs seek to predict the health impact of a policy, program or project (including a development) usually before implementation, and ideally early in the planning stage. They aim to facilitate the reduction or avoidance of negative impacts on human health and enhance the positive impacts.

Karst

Karsts are specialized geological formations related to erosion and dissolution of carbonate minerals contained in limestone and other sedimentary rocks. Caves are the most well known karst features. The term derives from the massive limestone area on the border between Italy and Slovenia.

Major modifications

Works, constructions, new equipment etc. that generate significant changes in operations, emissions, etc.

Metric tonnes

One metric tonne = 1000kg.

Mitigation

Mitigation means that companies do their best to reduce, neutralize, and repair the impacts of their activities on people and the natural environment.

Mothballing

Mothballing is a process of temporarily shutting down a facility or certain equipment for financial and / or technical reasons

Offset

An offset is an action taken outside, but near, a development site that reduces negative impacts.

Partial closure

Closure of part of a site or operational equipment (e.g. closure of a cement kiln while milling and packaging facilities are still in operation).

Reclamation

To return disturbed areas to a stable condition which does not create adverse environmental impact (e.g. returning disturbed quarry areas to a designated post-mining land use as required by permit).

Rehabilitation

To return a degraded ecosystem to an un-degraded condition, but which may also be different from its original one (EEA glossary).

Risk assessment

A technique to assess risk by analyzing the likelihood or magnitude of an incident or condition. Usually performed using a matrix analysis linked to a level of response or action. Can be used for risks to health and safety, environment, operations, reputation, or market condition. In these guidelines, use of this term does not imply any particular set of risk assessment processes.

Scoping

Scoping identifies which particular issues, their content and extent, should be covered in the environmental information submitted by the developer to the competent authority within an ESIA.

Screening

The screening stage is the process by which a decision is taken on whether or not an EIA / ESIA is required for a particular project.

Significance assessment

The basis for determining any action to protect cultural sites as part of a site management plan. It requires in depth knowledge of art and architectural history, social history, and knowledge of materials. There are usually many management alternatives for any site and understanding its significance is a prerequisite for deciding on a course of action. Adequate detail is also needed to

determine the best or most appropriate method of conserving the cultural significance, as different elements require different management strategies. See also Cultural significance, above.

Stakeholders

Stakeholders are people or institutions that feel they may be affected by, or may affect, an organization's activity.

Tonnes

See Metric tonnes.

Appendix 3 - Potential risks for cement projects

Introduction

Different risks will need to be considered at the scoping, construction, operations and closure stages, and will also be different for the company (and contractors) and the local community. A summary of the main potential risks for cement facilities is given below.

Scoping stage / greenfield site

Risks for company / investigators:

- > **Deposit investigation and design** (e.g. nature of deposits such as the amount of deposit and the geographical/geological features that may affect the extractability of the deposit)
- > **Climate** (e.g. high temperature and heavy rain)
- > **Geographical feature and topography** (e.g. risk factors of cliffs and rivers)
- > **Public security** (e.g. war zone)
- > **Well-being** (e.g. incidents and diseases)
- > **Epidemic diseases** (e.g. local diseases and SARS)
- > **Infrastructure** (e.g. transportation, accommodation, drinking water and supply of food).

Risks for local community (social issues):

- > **Stakeholder involvement** (e.g. communication and agreement on investigation)
- > **Location of the extraction site** in relation to local residential areas
- > **Transportation** route for the limestone in relation to local residential areas
- > **Conservation** of historic issues that may affect the site
- > Differences in various **operating regulations and standards** affecting the site
- > **Land use**
- > **Fragmentation of indigenous peoples/cultures and heritages**
- > **Social structure** (e.g. of the local community, local government policy and the politics and customs that may affect the proposed operations)
- > Local residential **population characteristics**
- > Loss of **livelihood** and alternative **land** for living
- > **Education**.

Risks for local community (environmental issues):

- > **Biodiversity** (e.g. flora and fauna in and around the extraction site)
- > **Landscape** (e.g. conservation of visual aspects especially as a result of the formation of a cutting face)
- > Requirements for site **restoration**.

Construction phase

Risks for company / contractors:

- > **Public security** (e.g. war zone)
- > **Well-being** (e.g. incidents and diseases)
- > **Epidemic diseases** (e.g. local diseases and SARS)
- > **Infrastructure** (e.g. transportation, accommodation, drinking water and supply of food).

Risks for local community (social issues):

- > **Stakeholder involvement** (e.g. communications with the local community and NGOs)
- > **Local community** (e.g. compensation payments)
- > **Local government policy** (e.g. politics and customs that may affect the proposed operations)
- > **Transportation** for the construction materials in relation to local residential areas (e.g. traffic accidents due to increase of traffic and air pollution)
- > **Friction** among various kinds of worker from outside area (e.g. as a result of different religions, customs and cultures)
- > Future long term **employment** after construction
- > Maintenance of local **infrastructure** such as highways and sewage systems.

Risks for local community (environmental issues):

- > **Dust** (e.g. from quarry operation and transport)
- > **Vibration** and fly rock from explosives
- > **Water pollution** due to the mine drainage or waste oil
- > **Noise** from heavy machines
- > **Landscape conservation**
- > **Treatment of wastes** from construction, soil of overburden and trees trimmed
- > Other **conservation** matters such as flora and fauna restoration, specific geographical features, cultural (heritage) properties etc.

Operations phase

Risks for company / contractors:

- > **Public security** (e.g. war zone)
- > **Well-being** (e.g. incidents and diseases)
- > **Epidemic diseases** (e.g. local diseases and SARS)
- > **Infrastructure** (e.g. transportation, accommodation, drinking water and supply of food).

Risks for local community (social issues)

- > **Stakeholder involvement** (e.g. prevention of pollution etc)
- > **Social structure** (e.g. deteriorating security due to expanding gaps between rich and poor, including risks for the local community and local government policy)
- > **Well-being** (e.g. local/public health care, safety and health)
- > **Education** (e.g. employees skill up and capacity building for local community)
- > **Profile of local stakeholders**, in particular local residents
- > Number of **long term local residents** who have traditionally lived in the area
- > Local residents who have relied on **traditional industries** such as agriculture and fishing which may have decreased
- > Development of **local industries** such as related cement and quarry business
- > **Disputes** concerning ground rights of individuals
- > **Employment**
- > **Water supply**.

Risks for local community (environmental issues):

- > **Dust** (e.g. from the cutting face, plant and transport)
- > **Vibration** and fly rocks from explosives
- > **Air pollution**
- > **Soil pollution**
- > **Visual aspects** (e.g. landscape conservation)
- > **Emissions** (mainly from main stack of kiln)
- > **Water pollution** due to mine drainage or waste oil
- > **Noise** from heavy machine and crushing plant
- > **Falling stone/rocks** from the edge of the cutting face
- > **Waste management** (e.g. management of PCBs and minimization of solid wastes)
- > **Transportation**

- > **Conservation matters** (e.g. flora and fauna restoration, specific geographical features, cultural / heritage properties)
- > **Management of CO₂ emissions**
- > **Conservation of natural resources**.

Site closure

Risks for company:

- > **Depletion of natural resources** (investigations into the next quarry site and acquisition of the land are likely to start before the current mining site has been operating for ten years).

Risks for local community (social issues):

- > **Stakeholder involvement**
- > **Reuse of the site**
- > **Local economic impact**
- > **Employment** (e.g. personnel relocation or support for substitution of local employment)
- > **Social structure**
- > **Safety and health** (e.g. restricted zone/ area, natural disaster preparedness).

Risks for local community (environmental issues):

- > **Biodiversity** (e.g. preserving wild and rare species of plants and the fauna, restoring the natural flora and fauna in each backfilling area)
- > **Rehabilitation**
- > **Monitoring** of soil and underground water at the site.

Appendix 4 - List of case studies

Scoping phase / greenfield site assess

- > Habitats, wildlife and biodiversity conservation. Cemex, Mexico
- > Conserving ancient kilns. Lafarge China

Construction phase

- > Soil and overburden management. Holcim (South Africa) Pty

Operations phase

- > School Center. Holcim's Colombian subsidiary
- > Local partnerships with Habitat for Humanity. Lafarge Venezuela, Lafarge subsidiaries in South Korea and Lafarge Romcim (Romania)
- > Plant safety improved through cleanliness and landscaping. Cantalgo, Lafarge Brazil
- > Meeting community challenges on environmental impacts. RMC in Croatia
- > Creating an ornithological observatory. Lafarge, Flicourt, France
- > Energy recovery from rice husks. Lafarge Cement, Illigan, The Philippines
- > Transportation of limestone from quarry to plant. Limestone Association of Japan
- > Quarry reforestation with fruit-bearing trees. Cemex Espana (Spain)

Closure of site

- > Community involvement in future site use, RMC subsidiary Rugby Cement, UK
- > Rehabilitation of cement quarry, Holcim Polpaico, Chile
- > Responsible restructuring, Holcim Lanka, Sri Lanka

Mitigation

- > Community well-being and environmental integration of a plant. Italcementi Group, Agadir

Stakeholder involvement

- > The costs of NOT involving stakeholder, RMC subsidiary Rugby Cement, UK
- > Community Advisory Panels, Holcim (US) Inc
- > Developing positive community relationships, RMC subsidiary Rugby Cement, UK

Appendix 5 - Key performance indicators

- 1 Percentage of sites with community engagement plans in place
- 2 Percentage of active sites with quarry rehabilitation plans in place
- 3 Number of active sites where biodiversity issues are addressed

Appendix 6 - Membership of CSI task force 5 on local impacts on land and communities

Ash Grove, USA

Mr. Fran Streiman

CEMEX, Mexico

Mr. Luis Morales Bustamante

Cimpor, Portugal

Mr. Rodrigo Fonseca

Corporación Uniland, Spain

Mr. Hamed Bessadd

CRH plc, Ireland

Mr. Stefan Lindfors

HeidelbergCement, Germany

Mr. Gerhard Friedel

Holcim, Switzerland

Mr. Albert Tien

Italcementi, Italy

Mr. Roberto Babich

Hercules (Lafarge), Greece

Mrs. Vicky Gazideli

Taiheiyo Cement Company, Japan

Mr. Yoshito Izumi

Mr. Hiroki Tsumura

Appendix 7 - The Cement Sustainability Initiative

The Cement Sustainability Initiative is a member-sponsored program of the World Business Council for Sustainable Development (WBCSD). It was started by a small group of cement companies in 1999. This small group quickly grew as other cement companies recognized the importance of these questions and the value answers might have in shaping their individual business strategies.

Today 16 companies are involved in the CSI. Individual companies themselves operate in many countries and consequently the geographic reach of the Initiative today covers more than 70 countries around the globe. Together these companies represent more than half the world's cement production capacity outside of China.

In 2002, the Initiative commissioned independent research to evaluate the current performance of the industry against the major sustainability issues it faced. The research was carried out by the Battelle Memorial Institute, a non-profit research organization in the US, under contract to the WBCSD. The research was supported by a series of facilitated stakeholder dialogues in seven cities (Cairo, Curitiba, Bangkok, Lisbon, Brussels, Washington DC, and Beijing). This initial research and consultation produced a set of independent recommendations for improving performance. In response to these recommendations, the CSI sponsoring companies developed an industry Agenda for Action to address the issues raised. These issues fell into six major areas:

- > Climate protection: How can the industry understand and manage the significant CO₂ emissions resulting from cement production?
- > Responsible use of fuels and raw materials: Can the industry use different fuels and raw materials to improve its resource efficiency and reduce its impacts on natural resources? What conditions are necessary to do so?
- > Improving employee health and safety: How can the industry improve its safety record and reduce the number of injuries and fatalities occurring in its operations?

- > Emissions monitoring and reporting: Most emissions from cement facilities are airborne pollutants. Around the world different regulatory regimes require monitoring different sets of pollutants. What needs to be measured and reported? What do local stakeholders want to know about?
- > Local impacts on land and communities: Impacts from quarrying and cement plants are large and visible. How can these be properly assessed in the project planning phase, and managed during operations and after closure?
- > Communications and progress reporting: How can the industry communicate more effectively with key stakeholders?

The Agenda for Action was published in July 2002, and in September 2002 the World Summit for Sustainable Development recognized the CSI as an effective Type II Partnership. Summary materials of the project are now available in nine languages. These and all other project documentation produced through early 2003 are available on a CD-rom through Earthprint, www.earthprint.com/ as well as on the project website: www.wbcscement.org.

Current status of the CSI

The CSI is now taking forward the Agenda for Action. Six Task Forces, each chaired by one or more of the CSI member cement companies, are developing materials to address the six major areas noted above, primarily in the form of good practice guidelines and procedures to be used by all CSI companies at their operating facilities. These materials will also be made available on a worldwide basis for other cement companies, should they choose to use them.

The Task Forces are committed to carrying out active stakeholder consultations and partnerships to develop a robust and useful set of guideline materials and implementation tools. WBCSD organized a facilitated stakeholder dialogue to discuss the guideline development in Brussels in November 2003, and some NGOs have provided additional expertise to specific Task Forces by invitation.

About the WBCSD

The World Business Council for Sustainable Development (WBCSD) is a coalition of 175 international companies united by a shared commitment to sustainable development via the three pillars of economic growth, ecological balance and social progress. Our members are drawn from more than 35 countries and 20 major industrial sectors. We also benefit from a global network of 50 national and regional business councils and partner organizations involving some 1,000 business leaders.

Our mission

To provide business leadership as a catalyst for change toward sustainable development, and to promote the role of eco-efficiency, innovation and corporate social responsibility.

Our aims

Our objectives and strategic directions, based on this dedication, include:

- > **Business leadership:** to be the leading business advocate on issues connected with sustainable development
- > **Policy development:** to participate in policy development in order to create a framework that allows business to contribute effectively to sustainable development
- > **Best practice:** to demonstrate business progress in environmental and resource management and corporate social responsibility and to share leading-edge practices among our members
- > **Global outreach:** to contribute to a sustainable future for developing nations and nations in transition

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