

Sub-sectoral Environmental Guidelines ***AGRICULTURAL PRODUCTION - CROPS***

PROCESS DESCRIPTION

This guideline covers the sowing, transplanting, growing and harvesting of plant material, including crops such as cotton, tobacco, vegetables, fruit, horticulture. These crops may be grown in open fields or under cover.

Agricultural crops are usually grown in large monocultures and modern farming techniques often involve the use of fertilisers and pesticides, irrigation systems and large scale machinery for ploughing, sowing and harvesting.

It should be noted that 'new' agricultural production may require an EIA.

SUMMARY OF KEY ENVIRONMENTAL RISK/LIABILITY FACTORS

The key environmental risk/liability factors specific to agricultural production are as follows:

Soil and groundwater contamination

Soil, groundwater and surface water contamination may occur primarily from the storage, application and disposal of agrochemicals (e.g. fertilisers, herbicides, pesticides, insecticides and defoliants). The past use of the site may also be a source of contamination (industrial contamination, anthrax, radioactive contamination, heavy metals).

Water supply and effluent discharge

Having a sufficient supply of good quality water when required is essential to all major crop production activities. Abstraction rates may be high. It is important to focus on the efficient use of water. Agricultural water consumption is often in competition with industrial water requirements and during periods of water shortage this may cause local/regional difficulties and disputes.

Releases of wastewater and runoff with a high nutrient content can have a significant adverse effect upon receiving waters (algal slimes, excessive enrichment killing aquatic life, etc.).

Agrochemical storage, use and disposal

The application of agrochemicals as well as posing potential soil and groundwater contamination risks, also poses potential nuisance risks, health and safety hazards and third party liability issues (such as the misapplication of pesticides resulting in damage to neighbouring crops, habitats and residential areas by spray drift). Disposal of empty drums and packaging of agrochemicals may pose both soil and groundwater and health and safety risks.

Pesticide resistance and bioaccumulation

Over-application of pesticides, herbicides and insecticides may lead to the build up of pest resistance which in turn leads to greater reliance upon the use of pesticides (either stronger formulations, a greater number of spray applications or alternative formulae) and this in turn leads to greater resistance in the insect and plant communities. This resistance/pesticide cycle can have significant financial implications in terms of yield and the quantity of agrochemicals that need to be applied to the crop. Inappropriate use of pesticides can cause build-up in crops and wildlife (bioaccumulation) which can have an adverse effect on the product, and in cases of significant pesticide build-up, an adverse health effect on the consumer.

Crop contamination

Contamination of agricultural crops can occur while the crop is growing, when it is harvested and during transport and storage. Contaminants may include radioactive isotopes (if the crops are grown in an area previously used for nuclear weapons storage or testing), heavy metals (from past industrial uses), fertilisers (cadmium) and pesticides (residual DDT in the soil, and the pesticides used on the crops) or neighbouring industrial activities (air, water or soil). Soils and produce should be tested to ensure that any contamination present is below the limits acceptable in the country of use and/or export.

‘New’ cropland should be tested for contaminants before being seeded.

FINANCIAL IMPLICATIONS

Potential financial implications from the environmental risks and liabilities identified in the previous section are wide ranging and may include:

- potential clean up costs for soil and ground contamination arising from the use, storage and application of agrochemicals or past site contamination;
- fines for the contamination of water courses from runoff or effluent discharges;
- capital expenditure for upgrades to irrigation systems, water storage provisions and water conservation/recycling systems;
- pesticide resistance may require the use of more expensive pesticides;
- spray drift may lead to compensation claims from neighbours;
- inadequate safety provisions for workers may lead to health and safety claims from affected employees;

- crop contamination may result in restrictions on markets available for export (EU and USA);
- constraints on production may occur as a result of conservation issues;
- fines for damage to soils (e.g. erosion, salination, compaction);
- ground or surface water abstraction fees.

<i>OTHER POTENTIAL ENVIRONMENTAL ISSUES</i>
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Potential environmental issues to be considered are:

- damage to soils and habitats;
- the storage of chemicals, fuels and oils (diesel, petrol and lubricating oils);
- general farming practices which may cause nuisance to neighbours;
- on site waste dumps.

Damage to soils and habitats

This may include erosion (soil and wind), salination (the capillary rise of salts through groundwater abstraction), overuse of fertilisers, compaction of soils, and habitat clearance for expansion of growing areas. The type of damage that occurs depends to a great extent on the crop being grown, the farming techniques applied and the prevailing ground conditions. For example, soil compaction is a problem for crops such as cotton and tobacco where heavy machinery is used on highly irrigated soils, while salination is often a problem where there is widespread over abstraction of groundwater.

Storage of chemicals, fuels and oils

Limited quantities of chemicals, fuels and oils are used in agricultural machinery. Over several years, spillages from poor handling practices and leakages from tanks may lead to localised contamination of soils. Security is also an important issue. Measures should be adopted to reduce the risks of health and safety hazards posed to third parties.

Important issues include:

- secondary containment of tanks to prevent spills reaching unmade ground and surface water courses;
- accident, fire and explosion precautions and emergency procedures;
- security of storage areas to prevent third parties misusing chemicals (or their containers);
- regular inspection/integrity testing of tanks.

Farming practices

General farming practices which may cause nuisance include:

- burning of organic matter (particulate emissions);
- slurry spreading (odour);
- use of public highways by farm vehicles (congestion);
- damage to sensitive habitats or those which are protected by legislation (e.g. flora and fauna conservation, archaeological or historical interests);
- soil degradation (loss of fertility, structure, organic matter).

Waste dumps

Many farms own waste dumps which have been used over many years for redundant farm equipment and vehicles, oil and pesticide drums and a variety of scrap materials. These waste dumps are often sited at the edge of a field, on the farm's boundary or on ponds or marshy ground and, as such, are likely to result in localised contamination which may migrate to neighbouring territory.

ENVIRONMENTAL IMPROVEMENTS

Potential improvements that can be achieved include:

- introduce an Integrated Pest Management Scheme to include:
 - the phase out of broad spectrum persistent pesticides/herbicides e.g. DDT, organophosphates, eldrin etc.
 - the introduction of biological and other non-chemical (systemic) control measures
 - the use of pest resistant strains.
- upgrade pesticide and hazardous materials storage areas to allow for appropriate containment;
- introduce crop diversification and rotation schemes;
- protect areas of conservation value and designate small protection zones on the farm if possible;
- reduce reliance upon fertilisers;
- implement water conservation measures (e.g. tail water recycling, holding areas);
- consider organic farming alternatives;
- avoid practices likely to give rise to nuisance complaints (on site burning, slurry pits).

ENVIRONMENTAL ACTION PLAN

Environmental management measures should focus on the main risk areas outlined in this guideline. The management plan for the farm should include details on safe use of agrochemicals, soil management, water management, good farming practices, crop yield and alternative crop production options.

GUIDE TO INITIAL DUE DILIGENCE SITE VISITS

During the tour of the farm it is important to gather information on the following issues:

- past site use (are there unused buildings, runways, vehicle dumps);
- storage areas for agrochemical and oils, maintenance areas and dump sites (look for signs of soil staining, distressed vegetation, water pollution);
- water supply and fate of run off waters;
- methods of agrochemical application, e.g. spraying methods used;
- damage to soils - salination, erosion, compaction etc.;
- volumes and types of pesticides, insecticides, herbicides and defoliant used;
- conservation areas or land protected from cultivation;
- any nuisance complaints from neighbours or outstanding worker compensation claims;
- permit requirements for abstraction, effluent discharge, on site burning etc;
- source and volumes of irrigation water.

Sub-sectoral Environmental Guidelines

ANIMAL HUSBANDRY

PROCESS DESCRIPTION

This guideline deals with the breeding or purchase of animals and managed weight gain (living regime) prior to resale or slaughter. Husbandry can include the production of by-products from the animals, such as eggs and milk. It also takes into account feeding, shelter, disease control and the general welfare of the animals.

SUMMARY OF KEY ENVIRONMENTAL RISK/LIABILITY FACTORS

- Risk of organic wastes (faeces, urine, blood etc.) entering and polluting watercourses
- Contamination of soil and groundwater from silage or slurry storage and transport
- Contamination of ground/air/water from use of pesticides
- Adulteration of product with pesticides, growth hormones, other chemicals and pathogens including for example Mad Cow Disease (Bovine Spongiform Encephalitis)
- Public/environmental health and nuisance issues (smell, noise etc.) associated with livestock
- Animal welfare issues (housing capacities, hygiene standards, feeding regimes etc.)
- Husbandry activities and neighbouring activities which could taint the food supply/livestock

FINANCIAL IMPLICATIONS

- Uncontrolled effluent run-off and soil and groundwater contamination could result in prosecution and fines, by local authorities.
- Nuisance issues with neighbours can be difficult to resolve and could lead to prosecution and compensation claims.
- More stringent regulations on housing/animal welfare requirements. While this might result in higher costs for the farmer, it will have beneficial effects in that well cared for stock will fetch higher prices on sale.
- Product liability issues (Bovine Spongiform Encephalitis [Mad Cow Disease]).

OTHER POTENTIAL ENVIRONMENTAL ISSUES

Potential environmental issues associated with animal husbandry include:

- water supply and wastewater management;
- storage of oils and pesticides;
- solid and hazardous waste management;
- welfare/ethical issues.

Water Supply and Wastewater Management

An adequate supply of water is required for watering livestock and washing out barns, milking parlours, etc. Water can be taken from municipal sources, abstraction wells, boreholes or rivers. Permits and charges will usually be required for water abstraction. Animal husbandry will produce large quantities of wastewater contaminated with high concentrations of organic wastes. Wastewaters may be sent to soakaway, spread on land, discharged to surface watercourse, or to sewers. Large husbandry units may have, or be required to have, wastewater treatment facilities. As with abstraction, discharge of wastewaters will often require permits and charges.

Issues to Consider:

- Integrity of drainage system. Check surface/foul drains, soakaways, underground drainage system, interceptors etc.
- Wastewater treatment facilities.
- Regulatory compliance - discharge consents, enforcement, costs.

Storage of Oils, Gases and Chemicals

Some oils and chemicals are utilised. Typical storage facilities include the following:

- Bulk storage fuel tanks (above and below ground).
- Drums of assorted pesticides, disinfectants.

Issues to Consider:

- Secondary containment of tanks (bunds etc.) to prevent spills reaching the wider environment.
- Regular integrity testing of underground storage tanks, bulk storage tanks, silage pits.
- Accident/fire precautions and emergency procedures.
- Location of storage tanks with regard to watercourses.
- Design of containment system for slurry and silage, e.g. earth banked lagoons, making sure there is sufficient capacity for farm production rates.

Solid and Hazardous Waste Management

Typical wastes might include, solid manure, slurries and sludges, animal carcasses, used dips/pesticides and waste oils.

Issues to Consider:

- Regulatory requirements, including waste disposal permits.
- Pollution of soil and groundwater.
- Means of solid/hazardous waste disposal and management. The costs of disposal of wastes on site versus discharge to sewers should be carefully considered. In the long term, on-site storage/disposal may be a cheaper option, though there is the danger that inadequate facilities may cause potential liabilities to accrue. Many husbandry units in CEE countries have been closed down because of surface water contamination. Solid wastes such as carcasses may be subject to specific regulatory requirements. This needs to be checked.
- On-site disposal sites, location, spreading of slurry on land etc. Any waste storage facilities should be located/relocated away from water courses.

Welfare/Ethical Issues

Welfare/ethical issues associated with animal husbandry are becoming of increasing financial relevance and may include:

- Housing capacity and hygiene standards;
- Diet (steroids, foie gras, force feeding);
- Method of transport and slaughter;
- Behavioural requirements.

<i>ENVIRONMENTAL IMPROVEMENTS</i>
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- Improvements in housing for livestock.
- Installation of wastewater treatment technology.
- Change to cleaner fuel sources.
- Use animal waste as fertiliser/fuel.
- Provision of secondary containment for bulk fuel oil and chemical storage areas.
- Leak proof containment and storage system for silage and animal effluent.

ENVIRONMENTAL ACTION PLAN

Environmental management measures should focus on the main risk areas outlined in this guideline as well as:

- the maintenance of legislative compliance at the facility;
- procedures for the handling and storage of liquid chemicals;
- disposal/treatment procedures for waste products;
- considerations relating to the health and safety of farm workers, livestock and the surrounding residents;
- knowledge, information and monitoring of hygiene and environmental performance.

GUIDE TO INITIAL DUE DILIGENCE SITE VISITS

When visiting the sites of potential borrowers or during loan supervision, investee companies should use the following as a practical guide to due diligence.

- Perform a complete tour of the site compound if possible, check if lagoons, silage/effluent storage are present and their proximity to water courses.
- Check for signs of pollution in water courses.
- Observe for signs of bad housekeeping, inadequate hygiene precautions e.g. rodents, flies, stock cleanliness and skin diseases.
- Note nature and location of solid waste and wastewater storage and disposal.
- Look for localised spills, leaking pipes etc.
- Check housing conditions, livestock density and welfare standards.
- Check waste discharge and water abstraction permits, plus any necessary veterinary certificates.
- Note proximity to nearest residential areas.

It is also suggested that contact is made with local regulatory agencies to determine compliance record and whether complaints have been made by the public.

Sub-sectoral Environmental Guidelines SLAUGHTER HOUSES

PROCESS DESCRIPTION

Meat processing operations include slaughtering and various subsequent processing activities ranging from basic cleaning and packaging to animal by-product rendering. The main activities at slaughter houses may include:

- receiving area for live animals prior to slaughter;
- retention area (12-24 hrs) for animals prior to slaughter;
- stunning of animals - methods include applying direct blow by a club or poleaxe, slaughtering mask, captive-bolt pistols or electrical stunning;
- bleeding of animals. The objective is to kill the animal with minimal damage to the carcass and to remove quickly as much blood as possible.
- skinning of animals;
- splitting, washing and dressing of carcasses;
- handling and transport of carcasses and meat.

Following animal slaughter, further processing may include butchering, meat packaging and refrigeration or frozen storage. Other secondary activities may generate by-products for use in the animal feed industry, soap or fatty acid trade. Processes involved may include:

- collection of the residues arising from the slaughter of animals;
- sterilising and stabilising;
- burning of waste and recovering fats and oils.

SUMMARY OF KEY ENVIRONMENTAL RISK/LIABILITY FACTORS

Hygiene/animal welfare

- Hygiene standards should be addressed in treating, handling and storage of animals and meat in all stages of production process;
- Regular hygiene and animal health checks should be carried out at all stages of the process, including for example:
 - inspection of live animals by a veterinarian prior to slaughter;
 - inspection of carcass following slaughter;

- Maintenance of high standards of cleanliness throughout the slaughter house;
- Humane transport and care of animals is becoming an increasingly significant issue with potential impact on sales and markets.

Water supply and effluent treatment

- Slaughter houses use large quantities of water for washing meat and cleaning processing areas. Effluent produced during the slaughtering process may generate pollution problems due to the high content of animal fat, waste, blood and any cleaning detergents. The effluent from slaughter houses may need to be treated and usually requires hot water spraying to dislodge fats that have accumulated in the on-site drainage system.

Air emissions

- Chlorofluorocarbons (CFCs) may be used in refrigeration or freezer plant. CFCs deplete the ozone layer and their production and use is now subject to control under national and international regulations.
- The main sources of atmospheric odour:
 - animal wastes (skin, hides, hooves), unprocessed material and any other solid waste;
 - in the animal-by-product rendering process, odour may be generated from cooking activities via leaking ducts on the processing equipment;
 - odour control may be a significant issue, particularly when the slaughter house is located near a residential area or in a hot climate. The main sources of odour may be animal wastes (e.g. skins, hides or hooves), unprocessed material and untreated effluent. Ammonia based systems may be required for cooling.

Health and safety

- Production areas pose various risks to employees as a result of slippery floors and surfaces caused by oil and fat deposits and through use of sharp butchering knives.

Disposal of Solid Wastes

- Unwanted remains must be disposed of in a hygienic manner approved by local health authorities.

<i>FINANCIAL IMPLICATIONS</i>

- Contamination of the soil or ground water on or around the site may result in the expenditure on the site clean up or reduced asset value.

- Environmental standards for odour control, waste disposal and effluent control and treatment may require capital investment, new equipment or increase operation cost of the whole process.
- Specific national or international legislative requirements relating to, for example, animal welfare, meat product hygiene standards or product storage and packaging may require modification to production processes and equipment increasing overall production costs or requiring additional capital investment.
- Income may be generated through sale of waste products, for example for use in animal feed or in the soap industry.

OTHER POTENTIAL ENVIRONMENTAL ISSUES

- Dust and gaseous emissions may arise from combustion plant which may be present on the site.
- Noise level, both internal, from machines or refrigeration units, and external, from animals, may constitute a local nuisance.

ENVIRONMENTAL IMPROVEMENTS

Potential environmental improvements are summarised below.

- Consider animal welfare during transport and holding of animals prior to slaughter.
- Keep processed and unprocessed meat and animal waste in an enclosed store with ventilation to suitable arrestment equipment. Ventilation equipment should be provided to maintain an adequate negative pressure within processing and clean areas to minimise the possibility of odours escaping to atmosphere without treatment.
- Animal matter should be processed as soon as possible to reduce offensive smell and noise problems.
- Good housekeeping should be maintained at all times in retention areas as well as in the slaughter house. The adoption of good cleaning and working practises as a routine will reduce odour emissions and improve hygiene standards.
- Regular, rigorous hygiene monitoring programmes should be in place.
- All surfaces and equipment should be cleaned regularly to prevent build-up of oil and fat and to reduce risk of health hazards.
- Design of chimney and vents of sufficient height and appropriate position to avoid causing a local nuisance.
- Regular inspection should be carried out of all bulk containment facilities on site.
- Fat interceptors should be installed on all drains and should be inspected and cleaned regularly.
- Effluent holding tanks and treatment facilities should be checked regularly.
- The use of CFC based refrigerants should be reviewed in the context of national and international CFC phase out programmes.

- Opportunities to generate income through the sale of animal by products should be considered.

ENVIRONMENTAL ACTION PLAN

- Develop an Environmental Action Plan (EAP) to include:
 - financial plan or budget for environmental management and performance improvement;
 - clear roles and responsibilities for hygiene and environmental management;
 - knowledge, information and monitoring of hygiene and environmental performance;
 - setting of environmental performance targets to meet regulations and best practice;
 - programme for environmental performance improvement to meet targets;
 - plans and procedures for managing environmental issues, including water abstraction, wastewater discharge and waste management and packaging;
 - schedule for revising and updating the EAP.
- Review associated systems, such as hygiene and health and safety procedures.

GUIDE TO INITIAL DUE DILIGENCE SITE VISITS

When visiting the sites of potential borrowers, investee companies or during loan supervision use the following as a practical guide to due diligence.

- Perform a complete tour of the slaughter house.
- Look for signs of poor housekeeping, such as odour levels, build up of fat and oil on floors and surfaces, and arrangements for the provision of personal protective equipment + hygiene standards, particularly in processing areas.
- Find out whether drainage systems lead to wastewater treatment systems or discharge directly and note the colour and appearance of adjacent water-courses.
- Identify what animal wastes are sent off the site for disposal.
- Identify what by-products are generated.
- Review the history of the site and the area, particularly any previous industrial use, in order to assess the likelihood of soil and groundwater contamination.
- Review measures of controlling the odour coming out from the plant during the operation in the slaughter house or transportation.
- Note the location and integrity of any bulk oil and chemical storage areas. These should be located away from operation areas and have measures to contain spillage.

- Assess the level of health and safety awareness at the slaughter house, for example, review the presence of safety notices and the general appearance of the site.
- Ask about programs for health and hygiene control, the frequency of visits by local regulatory authorities and any specific hygiene or production requirements which may be made by customers, particularly where the product is for export.

It is also suggested that contact is made with local regulatory agencies to determine the compliance record of the company and whether complaints have been made by the public.

PROCESS DESCRIPTION

This guideline covers the processing of fish and shellfish into fish products, it does not cover the subsequent packaging or canning of these products. Typically core processes include fish dressing, freezing, glazing, roe processing, milt processing, salting and smoking. Additional secondary process may include sorting, meal production, extraction of oils and packaging. Fish processing plants typically include:

- Docks and receiving area;
- Washing area;
- Dressing area;
- Smoking rooms;
- Salting rooms;
- Refrigeration units;
- Packaging units; and
- Product dispatch area.

The processes utilised in freshwater processing and marine processing are similar, however, the potential receptors for emissions often differ substantially between the two industry sectors. In marine fisheries primary processing is often conducted on ships with wastes typically being disposed of directly into the sea in contrast with freshwater fish facilities which are typically land based.

Processed products are usually distributed from the processing facility or docks by road to consumers, wholesalers and commercial food products manufacturers.

SUMMARY OF KEY ENVIRONMENTAL RISK/LIABILITY FACTORS

Water supply

Fish processing is a water-intensive industry. Process water is used for washing fish, cleaning process areas, cooling and production purposes. These processes typically require the provision of high quality water and can therefore represent considerable costs to the facility.

Effluent Treatment and Discharge

Large quantities of waste water are generated through activities such as fish unloading, equipment sprays, offal transportation and facility cleaning. The water is often subject to minimal treatment with the exception of primary screening/filtering to remove solids. Pollutant issues typically relate to:

- High levels of Total Suspended Solids (TSS);
- High organic load leading to elevated Biochemical Oxygen Demand (BOD);
- Elevated levels of salts;
- Oil and grease;
- Ammonia; and
- Cleaning agents (including chlorine bleaches and surfactants).

Wastewater is typically discharged into local water bodies (freshwater or marine) or into municipal sewers. Fish processing effluents can be acutely toxic to fish and other aquatic organisms.

Food hygiene and product contamination

As with any food processing activity, the potential exists for impact to the consumer as a result of contamination of the foodstuff either at source or during processing. Common potential contaminants include micro-organisms, heavy metals, organic compounds and foreign objects.

Odour

Fish processing plants typically generate strong odours and, depending on the location of the facility, odour can be a significant nuisance issue for neighbouring facilities and residential areas.

Refrigerants

Refrigeration is a core activity at many fish processing plants and the common refrigerants, freons (chlorofluorocarbons) and ammonia, may pose a hazard if released into the environment.

Air Emissions

In addition to the issues associated with the generation of odours, air emissions from activities such as smoking and associated facilities such as boilers may have the potential for detrimental impact on the environment. Within processing areas, respiratory illnesses have been known to occur in workers as a result of inhalation of proteinaceous materials and contaminated water mists.

Disposal of solid wastes

Fish processing typically does not generate large quantities of solid waste as many of the waste products of fish dressing can be used as supplements for animal feed.

Water Supply

The principal financial issues associated with water supply are the direct costs of supply (payment to water suppliers, costs of abstraction from groundwater or surface water bodies, sampling and analytical costs). The use of water leads to the generation of effluent and unnecessary consumption therefore can have knock-on implications for effluent discharge.

Effluent Treatment and Discharge

In most areas effluent discharge has direct financial implications for the processing plant through:

- Fees for discharge licences and permits;
- Monitoring costs; and
- Fines and penalties for negative environmental impacts or breaches of permit limits.

In many instances, the costs associated with upgrading facilities to meet the industry best practice standards are considered to be prohibitive and many processors have been prepared to pay the penalties imposed by regulators rather than invest in new systems.

World-wide tightening of environmental legislation is now making this approach less viable and many companies will need to spend considerable sums in order to achieve acceptable effluent discharge quality.

Wastewater treatment systems should involve primary filtration followed by some kind of secondary treatment to further reduce contamination by suspended solids and biological treatment to reduce organic loading.

Food hygiene and product contamination

Fish and fish products can be contaminated at source or during processing. In either case, the potential exists for substantial liabilities to be incurred by the processing and packaging company. Typically the liabilities take the following forms:

- Civil liabilities resulting in compensation claims from injured parties;
- Criminal liabilities, usually resulting from some form of negligence, resulting in fines and prohibitions; and
- Diminished reputation and sales as a result of damage to public perception of the company and/or the industry as a whole.

Odour

Depending on the location of the facility and the surrounding land use, financial liabilities relating to odour may be a significant factor for fish processing facilities. Odour control equipment can prove costly and improvements to waste management and storage procedures may provide substantial improvements to odour emissions for relatively limited costs.

OTHER POTENTIAL ENVIRONMENTAL ISSUES

Refrigerants

Refrigerants used on fish processing facilities are likely to be either ozone-depleting chemicals (principally chlorofluorocarbons) and/or ammonia. Providing the refrigeration systems are well maintained these materials should remain within a sealed system and would therefore pose little environmental threat. Release of these compounds into the atmosphere, however, would be expected to result in damage to the local and global environment.

Air Emissions

With the exception of odours, air emissions are unlikely to be a principal cause of concern in relation to the operation of fish processing facilities. Attention should, however, be paid to the operation and monitoring of smoking units and boilers. Such units may have the potential for creation of atmospheric emission problems relating to organic compounds (including polycyclic aromatic compounds) and particulates.

Materials Storage

Materials stored and used on fish processing sites have the potential to impact human health and the environment. The most significant of these materials are likely to be:

- Bleaches and cleaning fluids;
- Caustic soda;
- Oils and greases; and
- Fuels (particularly in instances where transportation fleets are based at the facility).

Polychlorinated Biphenyls (PCBs) & Asbestos

Neither PCB's nor asbestos are likely to be principal issues of concern in relation to fish processing facilities, however either material may be present and may therefore pose some potential for environmental impact.

With respect to these materials, particular attention should be paid to facilities constructed prior to the 1980's. Typically PCBs may be present as constituents of hydraulic oils or dielectric fluids in electrical switchgear, transformers and fluorescent light starters. Electrical equipment should be briefly inspected for signs of leaks, cracks, etc and staff questioned about the likelihood of fluids containing PCBs. Asbestos may be

encountered in a wide range of forms including asbestos cement boards (often used as roofing material), as fire retardant gaskets in pipework and as fire retardant insulation around boilers and furnaces.

ENVIRONMENTAL IMPROVEMENTS

Potential environmental improvements may include:

- Implementation of a waste minimisation and management system, for residual wastes, the possibility of re-using wastes for animal feed, etc should be investigated;
- Minimisation of water usage through recycling;
- Improvement of effluent monitoring and treatment facilities;
- Improvement or replacement of drainage systems to improve effluent management;
- Improvement of storage facilities to ensure containment of spills and to minimise odours;
- Upgrading of working area hygiene;
- Improvements to the screening and tracking of product to minimise the potential for food contamination;
- Installation of odour control equipment e.g. carbon filtration units; and
- Installation of emission control equipment on discharges from smoking units.

ENVIRONMENTAL ACTION PLAN

Any actions to address environmental health and safety issues identified during environmental due diligence audit should be presented in an Environmental Action Plan (EAP) which should list the actions required, as well as the associated costs, timeframe and responsibilities for implementation. EAPs should be included in legal agreement with the borrower or investing company. EAPs should address the following:

- A financial plan and budget for environmental management and performance improvement;
- Clear roles and responsibilities for environmental issues;
- Setting of environmental performance targets to meet regulatory standards and industry best practice;
- Timescales for the achievement of performance targets;
- Plans and procedures for managing environmental issues including waste generation, waste disposal, materials storage, materials handling and emergency response procedures;
- Instigation or improvement of environmental monitoring programmes;
- Regular inspection and testing of refrigeration systems;
- Implementation of regular food hygiene audits;
- A training plan for site personnel to ensure environmental awareness; and
- A schedule and procedure for review and updating of the environmental action plan.

A review of associated procedures such as hygiene and industrial health and safety procedures may also be of benefit.

GUIDE TO INITIAL DUE DILIGENCE SITE VISITS
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The following general issues should be reviewed during due diligence site visits of facilities such as fish processing plants:

- Permitting requirements and the presence/duration of appropriate permits;
- Any history of breaches of statutory or regulatory requirements;
- Statutory or other land use restrictions (particularly for new plants);
- The surrounding land uses and the potential for impacts associated with these uses;
- The sources, quality and nature of raw materials (including water) used in the site processes;
- Odours and air emissions;
- The condition and quality of materials storage facilities (including underground storage tanks), typical indicators of spillage include leaking pipes, stained ground, etc.
- Waste management and disposal procedures (in particular in relation to effluent processing and discharge);
- Effluent monitoring data;
- Procedures used to ensure food hygiene, including looking for signs of rodent or insect pest infestation and observations on the cleanliness of worker clothing;
- The condition and cleanliness of food processing and handling areas; and
- Any history of public complaints relating to the facilities operation.

It should be recognised that plant operation may be seasonal and visits should be timed accordingly.

It is recommended that contact should be made with local regulatory agencies to determine the compliance record and public complaints history of the facility.

Sub-sectoral Environmental Guidelines

COMMERCIAL FISHING

PROCESS DESCRIPTION

While there are many business activities that could be considered under the broad heading of commercial fishing, this subsector guideline deals with the environmental issues associated with the process of catching large volumes of fish at sea by trawler or smaller fishing vessels, such as coastal/artisanal fishery vessels. This guidance note does not cover fish farming, fish processing or shell fish harvesting.

The issues associated with commercial fishing can be categorised in three ways. Those issues relating to catch/effort restrictions (TACs, quotas, time at sea, numbers of licences, closed areas, etc); those relating to technical regulations (gear types and specifications, methods of deployment, minimum fish sizes, etc) and general environmental measures (fuel types, packaging, waste disposal, refrigeration, etc).

Large scale commercial fishing activities usually comprise a combination of fishing fleets (e.g., trawlers, longliners, purse seiners, etc), which catch the fish and factory ships, which process, freeze and sometimes pack the fish. More commonly, the large industrial trawlers process and freeze their own catch.

These vessels may catch either fish for human consumption or large volumes of small fish which are converted into fish meal and oil, for subsequent use as animal feed or fertiliser.

SUMMARY OF KEY ENVIRONMENTAL RISK/LIABILITY FACTORS

Resource Management

The management of wild fish stocks is vital for the sustainability of any commercial fishing activity. Advances in technology such as the use of GPS, acoustic gear monitoring and fisheries information systems beaming oceanographic data straight to ships at sea have greatly increased the fishing power of individual fishing vessels. In many parts of the world there are national and international regulations and treaties which limit catch sizes and fishing methodologies. Overfishing and the destruction of spawning sites often leads to a rapid decline in the profitability of commercial fishing activities. Overfishing is evident when abundance falls and increasingly smaller fish are taken.

Regulations governing fish quotas are usually specific to the type of technology that can be used. Mesh size of fishing nets is a key factor in affecting the size of fish caught and

it can also affect the range of species caught. Other national and international restrictions may include exclusion zones, fishing times, net size, gear limitations (no hydraulic winches).. Commercial fishing operations which employ the use of beam trawls and dredges to catch flat fish can often have a significant impact not only on the fish species being exploited but also on the sea bed habitats which sustain these species.

Operational Activities

Operational activities which may result in environmental issues of concern include refrigeration (CFC's), waste disposal (at sea), fuel usage (sulphur content, fuel spills), discarded nets and discharge of ballast and bilge water. Standards of practice and regulatory requirements vary between fishing territories as does the level of enforcement.

<i>FINANCIAL IMPLICATIONS</i>

Resource Management

Healthy, well managed wild stocks of fish are required in order to maintain sustainable yields of fish in the long term. If fish stocks are not well managed, overfishing will occur which could lead to catching fish of a smaller size and higher catches of non-target species. In many cases this results in an increased demand for these non-target species which, in turn, may come under pressure. In order to maintain valuable fish stocks and long term productivity, international treaties have been introduced which aim to reduce the fishing pressure on over-exploited species, reduce the incidental catches of non target species and other wildlife, and introduce protection zones for the recovery of fish stocks. In some areas this has resulted in a reduction in fishing quota's, less time allowed at sea, and restrictions in net size. These measures are often accompanied by an increase in the enforcement capability of the governing authority. In order to assess the financial implications of these measures on a commercial fishing operation, investors will need to determine what regulatory and trade-related restrictions exist and are likely to be introduced in the coming years. The viability of a commercial fishing operation may be constrained if stringent fishing quota's are, or are likely to be enforced.

Operational Activities

As well as assessing the condition of fishing vessels for their seaworthiness and asset value, investors need to assess standards of operational practice to ensure that compliance with international standards such as those laid down in the MARPOL and SOLAS conventions as well as those by the International Maritime Organisation (IMO). Substantial costs could be required in terms of technological upgrades (for refrigeration, winch gear, nets, fuel usage) as well as operational practices (waste management refrigerants and preventative maintenance). The phase out of CFC based refrigerants

over the next 5-10 years may also have significant financial implication for the larger, factory based fishing fleets.

OTHER POTENTIAL ENVIRONMENTAL ISSUES

Vessel Design / Sea Worthiness

There are design standards for fishing vessels and factory ships which have been established by the IMO. Any potential investor should ensure that the fishing fleet is seaworthy and complies with international safety design standards. The condition of vessels and preventative maintenance programme should also be assessed by potential investors, as equipment and refurbishment related upgrades could incur significant costs.

ENVIRONMENTAL IMPROVEMENTS

Potential environmental improvements include:

- Adherence to regulatory and voluntary codes of practice with regard to avoiding non-target species;
- avoid using fishing techniques which damage the sea bed environment (trawl beams and dredges);
- reporting accurate data to the relevant authorities in the required formats;
- adherence to IMO and FAO standards of practice;
- a comprehensive preventative maintenance programme;
- efficient low sulphur fuel usage;
- compliance with all restrictions relating to minimum mesh sizes, minimum landing sizes, seasonally protected areas, gear and net size restrictions;
- policies and practices which control waste disposal at sea, the discharge of ballast and bilge waters, the discarding of nets at sea and fuel usage; and
- consultation of the information on resource status and potential.

Also consult FAO Code of Conduct for Responsible Fisheries.

ENVIRONMENTAL ACTION PLAN

Environmental management measures should focus on the main risk areas outlined in this guideline as well as:

- Introducing procedures to reduce the catch of non-target species (e.g exclusion devices and sorting grilles), waste management, preventative maintenance and fuel consumption; and

- maintaining documentation regarding catches, incidents (discarded nets, activities of other fishing fleets, spills, equipment failure etc).

<i>GUIDE TO INITIAL DUE DILIGENCE SITE VISITS</i>
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During the initial inspection it will be important to assess the following:

- Design and condition of fishing vessels;
- type and age of equipment used;
- log of catches;
- information relating to quotas and technological restrictions;
- vessel maintenance programmes;
- type of refrigerant used; and
- regulatory controls and enforcement.

Contact should be made with the government departments for fish quota's and regulatory enforcement.