This Guidance Note 3 corresponds to Performance Standard 3. Please also refer to the Performance Standards 1, 2 and 4-8 as well as the corresponding Guidance Notes for additional information. Bibliographical information on all reference materials appearing in the text of this Guidance Note can be found in the References Section at the end.

Introduction

1. ***Performance Standard 3 recognizes that increased industrial activity and urbanization often generate increased levels of pollution to air, water, and land that may threaten people and the environment at the local, regional, and global level.[1] On the other hand, along with international trade, pollution prevention and control technologies and practices have become more accessible and achievable in virtually all parts of the world. This Performance Standard outlines a project approach to pollution prevention and abatement in line with these internationally disseminated technologies and practices. In addition, this Performance Standard promotes the private sector's ability to integrate such technologies and practices as far as their use is technically and financially feasible and cost-effective in the context of a project that relies on commercially available skills and resources.***

Objectives

- ***To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities***
- ***To promote the reduction of emissions that contribute to climate change***

[1] For the purposes of this performance standard, the term "pollution" is used to refer to both hazardous and non-hazardous pollutants in the solid, liquid, or gaseous forms, and is intended to include other forms such as nuisance odors, noise, vibration, radiation, electromagnetic energy, and the creation of potential visual impacts including light.

G1. To achieve these objectives, clients should take into account the potential impact of their emissions on the ambient conditions (such as ambient air quality) and seek to avoid or minimize these impacts within the context of the nature and significance of pollutants emitted. For small and medium–sized projects with limited potential emissions, this may be achieved through compliance with emissions and effluent standards and the application of other pollution prevention and control approaches. Large projects with potentially significant emissions and /or high impacts, however, may require impacts on the surrounding environment (i.e., changes in ambient levels) to be monitored, in addition to the implementation of control measures. Further information on how to address ambient conditions is provided in paragraph 9 of Performance Standard 3 and its accompanying Guidance Note.

G2. The potential environmental impacts associated with the emissions of greenhouse gases (GHGs) are considered to be among the most complex to predict and mitigate due to their global nature. Clients are therefore encouraged to consider their potential contribution to climate change when developing and implementing projects and develop a strategy to help reduce it.

Scope of Application

2. ***The applicability of this Performance Standard is established during the Social and Environmental Assessment process, while implementation of the actions necessary to meet the requirements of this Performance Standard is managed through the client's Social and Environmental Management System. The assessment and management system requirements are outlined in Performance Standard 1.***

G3. Impacts and risks associated with the generation, use, storage, release, and/or disposal of pollutants are identified during the Social and Environmental Assessment process, planned as part of the client's Social and Environmental Management, and implemented as part of the client's Action Plan. Since not all potential impacts can possibly be identified at the outset of a project, the client should uphold the requirements of pollution prevention and abatement provided in Performance Standard 3 as part of its Management System so that those unforeseen circumstances that are identified during the course of the project can be evaluated and addressed.

Requirements

General Requirements

3. ***During the design, construction, operation and decommissioning of the project (the project life-cycle) the client will consider ambient conditions and apply pollution prevention and control technologies and practices (techniques) that are best suited to avoid or, where avoidance is not feasible, minimize or reduce adverse impacts on human health and the environment while remaining technically and financially feasible and cost-effective.[2] The project-specific pollution prevention and control techniques applied during the project life-cycle will be tailored to the hazards and risks associated with project emissions and consistent with good international industry practice,[3] as reflected in various internationally recognized sources, including IFC's Environmental, Health and Safety Guidelines (the EHS Guidelines).***

[2] "Technical feasibility" and "financial feasibility" are defined in Performance Standard 1. "Cost-effectiveness" is based on the effectiveness of reducing emissions relative to the additional cost required to do so.

[3] Defined as the exercise of professional skill, diligence, prudence and foresight that would reasonably be expected from skilled and experienced professionals engaged in the same type of undertaking under the same or similar circumstances globally. The circumstances that skilled and experienced professionals may find when evaluating the range of pollution prevention and control techniques available to a project may include, but are not limited to, varying levels of environmental degradation and environmental assimilative capacity as well as varying levels of financial and technical feasibility.

(i) Development of a new project (including major expansion of an existing operation)

G4. Clients developing new projects or major expansions should incorporate environmental aspects of the project during the design phase (including project design and site selection). Considerations should include background ambient conditions (that may occur due to natural and/or anthropogenic causes not related to the project), the presence of local communities, environmentally sensitive receptors (such as potable water supplies or ecologically protected

areas), the expected project demand for water, and the availability of waste disposal infrastructure.

G5. Key environmental impacts can occur at any phase of a project and depend on a number of factors including industry sector and site location. Therefore, the design approach should encompass all physical phases of a project, from site investigation and construction through operation to decommissioning. Potential future expansions should be accounted for in the initial design, where possible.

G6. Environmental aspects of the decommissioning stage should be also considered, both during initial design and during periodic reviews undertaken as part of the management system.

(ii) Privatizations, modernizations, and retrofits of existing facilities:

G7. If clients do not have the opportunity to incorporate these environmental aspects into the design phase because a project involves or consists of existing facilities, they are expected to evaluate the feasibility of meeting the requirements of Performance Standard 3, and seek to improve performance through mutually agreed milestones included in the Action Plan.

G8. Clients with existing operations should assess possibilities for investing in environmental and risk management improvements by performing relevant studies including industrial risk assessment or hazard and operability studies, taking into account facility operations at full load under routine circumstances including intermittent exceedances during startups, shutdowns, and warm-up periods.

> ***Pollution Prevention, Resource Conservation and Energy Efficiency***
> 4. ***The client will avoid the release of pollutants or, when avoidance is not feasible, minimize or control the intensity or load of their release. This applies to the release of pollutants due to routine, non-routine or accidental circumstances with the potential for local, regional, and transboundary impacts.[4] In addition, the client should examine and incorporate in its operations resource conservation and energy efficiency measures, consistent with the principles of cleaner production.***

[4] In reference to transboundary pollutants, including those covered under the Convention on Long-range Transboundary Air Pollution.

G9. Where control techniques are necessary to minimize emissions or achieve a pre-established performance level, the client should monitor their performance to ensure that the requirements of Performance Standard 3 are being met. The frequency with which pollutant emissions are monitored should be appropriate to the nature and scale of potential impacts. This may range from continuous to daily, monthly, annually, or less frequently. Clients can obtain guidance on recommended monitoring approaches and frequencies appropriate to the nature of their operations from various internationally recognized sources including the EHS Guidelines (as included in the References section). Monitoring emissions can benefit clients by: 1) demonstrating their compliance with environmental permits or other legal obligations; 2) providing information to evaluate project performance and determine if corrective actions are necessary; 3) helping to identify opportunities for further improvement; and 4) by making data

available for analysis of actual incremental impacts on the ambient levels (especially for projects with potentially significant emissions impacts).

G10. Monitoring is particularly important for large projects with impacts that may be uncertain and potentially irreversible and consequently in need of more frequent evaluation of emissions levels or ambient quality. In addition, clients should include monitoring processes within their management system to alert them to significant increases in pollutant emissions or impacts on ambient conditions that may be an indicator of problems with manufacturing processes or pollution control equipment that could require corrective action (see Performance Standard 1 and its accompanying Guidance Note).

G11. The management systems approach may also include an element of continual improvement which, in the application of Performance Standard 3, should encourage performance levels that go beyond compliance with emissions and effluent standards or guidelines. Improvements may include efficiency gains in production processes that result in improved operational, environmental, or financial performance through, for example, improvements in energy/water consumption per unit of industrial output and solid/liquid waste production per unit of industrial output.

G12. Pollutant release and transfer registers that collect and disseminate data on environmental releases and transfers of pollutants from industrial facilities have been found to be effective for promoting pollution reduction in some industrial sectors – particularly where all or most industrial facilities operating within a geographic region participate and where the information is made accessible to local communities. Where such registries are not already required by law, and in addition to meeting the disclosure requirements of Performance Standard 1 for disclosure of significant potential environmental impacts, clients are encouraged to participate in voluntary initiatives that seek to establish formal pollutant release and transfer registers at the national or regional levels. A reference for additional information on pollutant release and transfer registers is included in the References section.

G13. Cleaner production refers to the concept of integrating pollution reduction into the production process and the design of a product. This involves continuous application of an integrated preventive environmental strategy to processes, products, and services in order to increase overall efficiency and reduce risks to humans and the environment through the conservation of raw materials, water and energy, and through the reduction or elimination of the use of toxic and hazardous raw materials.[1] Cleaner production can also mean taking advantage of renewable energy sources such as solar energy and geothermal resources. Cleaner production and energy efficiency are often cost-effective, especially when assessed over the project life-cycle. The client is encouraged to keep abreast of cleaner production examples applicable to its project sector and apply them to the design of the project when technically and financially feasible and cost-effective. References to various examples of cleaner production are included in the References section. Additional guidance is provided in the General EHS Guidelines and Industry Sector EHS Guidelines.

G14. Examples of energy efficiency measures include more energy efficient electricity generation, cogeneration to achieve overall energy utilization efficiency, and the installation of

[1] United Nations Environmental Program (UNEP)

more energy efficient demand-side equipment (e.g. electric motors, heaters, lighting fixtures, etc.). Opportunities for demand-side energy savings with financial benefits are common to almost all industry sectors. Examples of renewable energy sources include solar power, hydro, wind, certain types of geothermal, and biomass. Renewable energy sources are particularly beneficial when they can be used in project operations that include an energy generation component that would otherwise produce potentially significant emissions.

> ***Wastes***
>
> 5. ***The client will avoid or minimize the generation of hazardous and non-hazardous waste materials as far as practicable. Where waste generation cannot be avoided but has been minimized, the client will recover and reuse waste; where waste can not be recovered or reused, the client will treat, destroy, and dispose of it in an environmentally sound manner. If the generated waste is considered hazardous,[5] the client will explore commercially reasonable alternatives for its environmentally sound disposal considering the limitations applicable to its transboundary movement.[6] When waste disposal is conducted by third parties, the client will use contractors that are reputable and legitimate enterprises licensed by the relevant regulatory agencies.***

[5] As defined by local legislation or international conventions.

[6] Consistent with the objectives of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes.

G15. Because of the risks to the environment and the ever-increasing costs and liabilities associated with the management and disposal of waste material, Performance Standard 3 requires clients to investigate options for waste avoidance, waste recovery and waste disposal during the operational stage of the project. The level of effort in addressing this requirement depends on the risks associated with the waste materials generated by a project. Clients should reasonably inquire about the location of the final disposal of their waste, even if the disposal is conducted by a third party, and especially if the waste is considered to be hazardous to human health and the environment. If no suitable disposal method is available through commercial or other means, the client should develop their own recovery or disposal facilities or work through their local business association or other similar entity to identify viable alternatives or approaches. Additional guidance is provided in the General EHS Guidelines and Industry Sector EHS Guidelines.

G16. In cases where the waste treatment, storage, or disposal alternative selected has the potential to generate polluting emissions, the client should apply adequate control techniques to avoid, minimize or reduce these emissions according to the requirements of paragraphs 4, 10 and 11 of Performance Standard 3. Further information on the environmentally sound handling and disposal of wastes can be found in the EHS Guidelines as referred to in paragraph 8 of Performance Standard 3 and its accompanying Guidance Note, as well as numerous publications in support of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and in support of the Stockholm Convention on Persistent Organic Pollutants (see the References Section).

> ***Hazardous Materials***
>
> 6. ***The client will avoid or, when avoidance is not feasible, minimize or control the release of hazardous materials resulting from their production, transportation, handling, storage and use for project activities. The client will avoid the manufacture, trade, and use of***

chemicals and hazardous materials subject to international bans or phase-outs due to their high toxicity to living organisms, environmental persistence, potential for bioaccumulation, or potential for depletion of the ozone layer,[7] and consider the use of less hazardous substitutes for such chemicals and materials.

[7] Consistent with the objectives of the Stockholm Convention on Persistent Organic Pollutants and the Montreal Protocol on Substances that Deplete the Ozone Layer. Similar considerations will apply to certain World Health Organization (WHO) classes of pesticides.

G17. Because the best way to prevent the release of hazardous materials is to avoid using them in the first place, clients should explore opportunities throughout the project life-cycle to use non-hazardous materials in place of hazardous materials, especially where the hazards of the materials cannot easily be prevented under normal use and disposal at the end of their life cycle. Substitutions have been found, for example, for the use of asbestos in building materials, PCBs in electrical equipment, persistent organic pollutants in pesticides formulations, and ozone depleting substances in refrigeration systems. A reference to guidelines on ozone depletion substances is included in the References section.

G18. Where a project has the potential to release toxic, hazardous, flammable or explosive material, or where project operations could result in injury to plant personnel or the public as identified in the Social and Environmental Assessment, the client should conduct a hazard analysis of their operations. Hazard analysis is often conducted in conjunction with Hazard and Operability studies (HAZOP) and allows clients to systematically identify systems and procedures that could result in accidental pollutant release and also helps to prioritize the allocation of resources for emergency response equipment and training programs.

G19. Clients should review the list of active ingredients included in Annex A and B of the Stockholm Convention and ensure that no chemical formulations are manufactured, sold or used in the project that include these ingredients unless it is under the highly exceptional circumstances noted in Annexes A and B of the Stockholm Convention. Persistent Organic Pollutants are chemicals that have five characteristics of environmental and public health concern: they are toxic, long-lived, mobile, accumulate in fatty tissue and magnify in the food chain. Their high mobility makes them a global issue, while their other properties mean that they are hazardous to animal and human health even at low levels of exposure. Where projects have pre-existing involvement with such ingredients, including the presence of existing stockpiles of obsolete chemicals, the Action Plan should include a phase-out plan for the client to meet Performance Standard 3 in a reasonable amount of time. Clients should manage and ultimately dispose of PCBs identified on the project site, in an environmentally sound manner, according to the terms of the Stockholm Convention. Further guidance on the management and disposal of PCBs can be found in the EHS Guidelines.

G20. The client should also minimize the unintentional generation and release such as by incineration, of chemicals listed in Annex C of the Stockholm Convention, as outlined in that Annex. Guidance on how to identify, quantify and reduce emissions of Annex C chemicals from potentially significant sources is included in the publications in support of the Stockholm Convention as included in the References section. Due to its association with the unintentional release of persistent organic pollutants, primarily through the incineration of mixed waste streams containing PVC products, when developing projects that manufacture PVC products,

clients should weigh the overall benefits of the project against costs, including those to the environment and the communities.

G21. The client should also review the list of chemicals included in Annex III of the Rotterdam Convention of Prior Informed Consent for Certain Hazardous Chemicals and Pesticides in International Trade (See the References Section) and seek to prevent their manufacture, trade and use. These chemicals are listed in this international convention because their use has been banned or severely restricted in one or more national jurisdictions in order to protect human health and the environment. The list also includes some pesticide formulations considered severely hazardous due to their severe health or environmental effects.

Emergency Preparedness and Response

7. ***The client will be prepared to respond to process upset, accidental, and emergency situations in a manner appropriate to the operational risks and the need to prevent their potential negative consequences. This preparation will include a plan that addresses the training, resources, responsibilities, communication, procedures, and other aspects required to effectively respond to emergencies associated with project hazards. Additional requirements on emergency preparedness and response are found in paragraph 12 of Performance Standard 4.***

G22. While the emergency preparedness and response requirements of Performance Standard 3 refer to the contingencies that could affect personnel and facilities within the physical project boundaries, clients should also take into account the need to protect the health and safety of project workers (as noted in paragraph 16 of Performance Standard 2) and the affected community (as noted in Performance Standard 4) and address emergency preparedness and response in an integrated way. Whether clients are developing a new project or expanding an existing facility, they should address contingencies associated with process upset and accidental circumstances through the use of emergency response plans or other similar tools appropriate to the specific industry sector, as part of the Action Plan. Additional guidance is provided in the General EHS Guidelines and Industry Sector EHS Guidelines.

G23. Effective emergency response plans help clients prepare for the best outcomes while assuming the worst possible scenarios. They include clearly assigned responsibilities for the assessment of the degree of risk to life and property with procedures on whom to communicate different types of emergencies with and how. These plans should also include procedures for shutting down equipment and production processes and for evacuations, including a designated meeting place outside the project site. Additionally, effective emergency plans should include specific training and practice schedules and equipment requirements for employees who are responsible for rescue operations, medical duties, hazardous responses, fire fighting and other responses specific to project site. Further guidance on minimizing the occurrence and harmful effects of technological accidents and environmental emergencies can be found in the References section.

Technical Guidance

8. ***The client will refer to the current version of the EHS Guidelines when evaluating and selecting pollution prevention and control techniques for the project. These Guidelines contain the performance levels and measures that are normally acceptable and applicable to projects. When host country regulations differ from the levels and measures presented in***

the EHS Guidelines, clients will achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the client will provide full and detailed justification for any proposed alternatives. This justification will demonstrate that the choice for any alternate performance levels is consistent with the overall requirements of this Performance Standard.

G24. The client should refer to the current versions of the EHS Guidelines when evaluating and selecting pollution prevention and control techniques for the project. These documents contain the performance levels and measures that are normally acceptable to IFC and are generally considered to be achievable at reasonable costs by existing technology. The discharge effluent, air emissions, and other numerical guidelines and performance indicators as well as other prevention and control approaches included in the EHS Guidelines are considered to be default values applicable to new projects, though the application of alternate performance levels and measures may be considered. As described in Performance Standard 3, clients that request application of alternate performance levels of measures (typically for projects involving existing facilities with older equipment and pollution control technologies) must provide justification and explanation for any levels or measures that are less stringent than those identified in the EHS Guidelines and demonstrate consideration of impacts to ambient quality, human health, and the environment. The EHS Guidelines also provide general or industry-specific information relevant to the Occupational Health and Safety aspects of Performance Standard 2, Community Health and Safety aspects of Performance Standard 4, and Biodiversity Conservation and Natural Resource Management under Performance Standard 6.

G25. Clients with projects having significant emissions or whose operations are in already degraded environments should also strive to improve their performance beyond the performance levels and measures articulated in the EHS Guidelines.

Ambient Considerations

9. ***To address adverse project impacts on existing ambient conditions,[8] the client will: (i) consider a number of factors, including the finite assimilative capacity[9] of the environment, existing and future land use, existing ambient conditions, the project's proximity to ecologically sensitive or protected areas, and the potential for cumulative impacts with uncertain and irreversible consequences; and (ii) promote strategies that avoid or, where avoidance is not feasible, minimize or reduce the release of pollutants, including strategies that contribute to the improvement of ambient conditions when the project has the potential to constitute a significant source of emissions in an already degraded area. These strategies include, but are not limited to, evaluation of project location alternatives and emissions offsets.***

[8] Such as air, surface and groundwater, and soils.

[9] The capacity of the environment for absorbing an incremental load of pollutants while remaining below a threshold of unacceptable risk to human health and the environment.

(i) Development of a new project (including major expansion of an existing operation):

G26. When developing a new project that is expected to produce potentially significant emissions of pollutants, clients should evaluate whether the existing background ambient levels are in compliance with the relevant ambient quality guidelines and/or standards. Ambient

quality standards are ambient quality levels established and published through national legislative and regulatory processes, and ambient quality guidelines refer to ambient quality levels primarily developed through clinical, toxicological, and epidemiological evidence (such as those published by the World Health Organization).

G27. If the ambient levels exceed the relevant ambient quality guidelines or standards (i.e., ambient conditions are already deteriorated), clients are expected to demonstrate that they have explored and, if necessary, adopted a higher level of performance than would be otherwise required under less deteriorated ambient conditions as well as further mitigation measures (e.g. offsetting emissions, modifying site selection) in order to minimize further deterioration of the environment or preferably to achieve improvement. If ambient levels are in compliance with relevant ambient quality guidelines and/or standards, projects with potentially significant emissions of pollutants should be designed so as to reduce the potential for significant deterioration and to ensure continuing compliance. References to internationally-recognized ambient quality guidelines and standards (including those published by the World Health Organization) are included in the References section.

(ii) Privatizations, modernizations, and retrofits of existing facilities:

G28. Where a project that is expected to produce potentially significant emissions of pollutants involves the privatization, modernization, or retrofit of an existing facility, clients are encouraged to evaluate whether the current ambient conditions are in compliance with the ambient quality guidelines and/or standards. If the levels exceed the ambient quality guidelines and/or standards, and if the existing facility is one of the major sources of emissions affecting such exceedances, clients are encouraged to evaluate feasibility of options to reduce emissions and implement selected options (e.g. rehabilitation of existing operations, arranging emissions offsets outside project boundary) so that the already deteriorated ambient conditions will be improved targeting the relevant ambient quality guidelines and/or standards.

(iii) Projects located in or near ecologically sensitive areas:

G29. Clients with projects whose area of influence includes ecologically sensitive areas such as national parks should implement measures to avoid or minimize their incremental impacts on these areas to the extent technically and financially feasible and cost effective.

Greenhouse Gas Emissions

10. ***The client will promote the reduction of project-related greenhouse gas (GHG) emissions in a manner appropriate to the nature and scale of project operations and impacts.***

11. ***During the development or operation of projects that are expected to or currently produce significant quantities of GHGs,[10] the client will quantify direct emissions from the facilities owned or controlled within the physical project boundary and indirect emissions associated with the off-site production of power used by the project. Quantification and monitoring of GHG emissions will be conducted annually in accordance with internationally recognized methodologies.[11] In addition, the client will evaluate technically and financially feasible and cost-effective options to reduce or offset project-related GHG emissions during the design and operation of the project. These options may include, but are not limited to,***

carbon financing, energy efficiency improvement, the use of renewable energy sources, alterations of project design, emissions offsets, and the adoption of other mitigation measures such as the reduction of fugitive emissions and the reduction of gas flaring.

[10] The significance of a project's contribution to GHG emissions varies between industry sectors. The threshold for this Performance Standard is 100,000 metric tons CO_2 equivalent per year for the aggregate emissions of direct sources and indirect sources associated with purchased electricity for own consumption. This or similar thresholds will apply to such industry sectors or activities as energy, transport, heavy industry, agriculture, forestry, and waste management in order to help promote awareness and reduction of emissions.

[11] Estimation methodologies are provided by the Intergovernmental Panel on Climate Change (IPCC), various international organizations, and relevant host country agencies.

G30. In order to determine the applicability of this requirement to a project, the client should determine if the project falls into sectors that have the potential for emitting one or more of the following six greenhouse gases that form part of the Kyoto Protocol to the United Nations Framework Convention on Climate Change:

(i) Carbon dioxide (CO_2)
(ii) Methane (CH_4)
(iii) Nitrous oxide (N_2O)
(iv) Hydrofluorocarbons (HFCs)
(v) Perfluorocarbons (PFCs)
(vi) Sulphur hexafluoride (SF_6)

G31. Examples of sectors that have potentially significant emissions of greenhouse gases include: energy, transport, heavy industry, agriculture, forestry and waste management. Reduction and control options considered by clients in these and other sectors include: (i) enhancement of energy efficiency, (ii) protection and enhancement of sinks and reservoirs of greenhouse gases, (iii) promotion of sustainable forms of agriculture and forestry, (iv) promotion, development and increased use of renewable forms of energy, (v) carbon capture and storage technologies, and (vi) limitation and/or reduction of methane emissions through recovery and use in waste management, as well as in the production, transport and distribution of energy (coal, oil, and gas). Carbon finance may create additional funding sources for pursuing these reduction and control options. Illustrative examples of project activities that may result in potentially significant emissions of GHGs can be found in Annex A

G32. Indirect emissions associated with the off-site production of power used by the project can be estimated by using a national average GHG emissions performance for electricity generation (e.g., national average of carbon dioxide emissions per unit of electricity generated for the country). More project specific GHG emissions performance for electricity generation should be used if available (e.g., utility average of carbon dioxide emissions per unit of electricity generated for the utility from which the project purchases electricity). Several sources providing statistics on national average GHG emissions are included in the References section.

G33. When developing a project that is expected to produce a significant emission of GHGs the client should consider options to reduce or offset the GHGs, as described above. The use of carbon financing as a carbon emissions reduction strategy may include the host government-endorsed Clean Development Mechanism or Joint Implementation of the United Nations

Framework Convention on Climate Change. For the oil and gas sector, the client should seek to reduce flaring and venting of gas associated with the extraction of crude oil. Examples of gas flaring reduction approaches taken by governments and the petroleum industry include the Global Gas Flaring Reduction Public-Private Partnership sponsored by the World Bank Group.

G34. Clients are encouraged to disclose their GHG emissions annually through corporate reports, or through other voluntary disclosure mechanisms currently being used by private sector companies internationally of which an example has been included in the References section.

G35. Suggested GHG quantifying and monitoring practices are provided in Annex A.

Pesticide Use and Management

12. ***The client will formulate and implement an integrated pest management (IPM) and/or integrated vector management (IVM) approach for pest management activities. The client's IPM and IVM program will entail coordinated use of pest and environmental information along with available pest control methods, including cultural practices, biological, genetic and, as a last resort, chemical means to prevent unacceptable levels of pest damage.***

13. ***When pest management activities include the use of pesticides, the client will select pesticides that are low in human toxicity, known to be effective against the target species, and have minimal effects on non-target species and the environment. When the client selects pesticides, the selection will be based on whether the pesticides are packaged in safe containers, are clearly labeled for safe and proper use, and have been manufactured by an entity currently licensed by relevant regulatory agencies.***

14. ***The client will design its pesticide application regime to minimize damage to natural enemies and prevent the development of resistance in pests. In addition, pesticides will be handled, stored, applied, and disposed of in accordance with the Food and Agriculture Organization's International Code of Conduct on the Distribution and Use of Pesticides or other good international industry practice.***

15. ***The client will not use products that fall in World Health Organization Recommended Classification of Pesticides by Hazard Classes Ia (extremely hazardous) and Ib (highly hazardous); or Class II (moderately hazardous), if the project host country lacks restrictions on distribution and use of these chemicals, or if they are likely to be accessible to personnel without proper training, equipment, and facilities to handle, store, apply, and dispose of these products properly.***

G36. Performance Standard 3 requires that the client use pesticides only to the extent necessary to achieve the project objectives under an integrated pest management and integrated vector management approach and only after other pest management practices have failed or proven inefficient. In the event that the use of pesticides beyond isolated or incidental use is proposed as an integral aspect of the client's activities, the client should present evidence in the Social and Environmental Assessment of the need to use pesticides that describes the proposed use and intended users, and the nature and degree of associated risks. Under these circumstances, clients should also take into consideration the potential impacts to the health and resources of nearby communities as described in Performance Standard 4 and its

accompanying Guidance Note. Relevant international guidelines on hazardous chemicals are included in the References section.

G37. Clients who finance agricultural activities that require the use of pesticides by third parties should promote the use of integrated pest management and integrated vector management approaches through all feasible means of dissemination of information about these agricultural approaches.

G38. The client is expected to exercise a high degree of diligence in the selection of pesticides so that the pesticides selected are designed to meet the project's technical and scientific specifications. When selecting pesticides for use, the client should consider the need for appropriate precautions to prevent the improper use of the pesticides and to protect the health and safety of the project workers and the affected community in accordance with the principles and requirements of paragraph 16 of Performance Standard 2 and Performance Standard 4.

G39. The packaging requirements for pesticides of Performance Standard 3 are intended to protect the health and safety of persons involved in the transportation, storage and handling of the pesticides, and to reduce the need for transfer between containers or repackaging into improvised containers. The labeling requirements should clearly identify the contents of the packaging and include instructions for intended use as well as safety information. Packaging and labeling of pesticides should be done in a form that is appropriate for each specific market, but should follow the guidelines for the proper packaging and labeling of pesticides which have been published by the Food and Agriculture Organization, as included in the References section.

G40. Purchasing pesticides manufactured under license will increase the likelihood that the pesticides meet minimum quality and purity conditions consistent with the use and safety documentation provided. The client should refer to and follow the recommendations and minimum standards described in the guidelines published by the Food and Agriculture Organization, as included in the References section

G41. The storage, handling, application, and disposal of pesticides according to good international industry practice should include a program to discontinue the use of pesticides listed in Annex A of the Stockholm Convention, and to store and dispose of them in an environmentally sound manner, especially when these pesticides are considered obsolete.

G42. The client should seek to promote the responsible management and use of pesticides within the context of integrated pest management and integrated vector management by interacting with the agricultural extension services or similar organizations that may be available locally. Additional guidance is provided in the General EHS Guidelines and Industry Sector EHS Guidelines.

Annex A
Suggested GHG Quantifying and Monitoring Practice

Suggested GHG emissions estimation methodologies:

There are many greenhouse gas emission estimation methodologies available for use by private sector projects. The most authoritative and updated methodologies can be found in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. The 2006 IPCC Guidelines that consist of Volume 1 (General Guidance and Reporting), Volume 2 (Energy), Volume 3 (Industrial Processes and Product Use), Volume 4 (Agriculture, Forestry and Other Land Use) and Volume 5 (Waste) provide suggested estimation methodologies for a number of activities and sectors.

These 2006 IPCC Guidelines build on the previous Revised 1996 IPCC Guidelines and the subsequent Good Practice reports, and cover new sources and gases as well as updates to previously published methods where technical and scientific knowledge have improved. Clients with projects producing significant GHG emissions who were using the Revised 1996 IPCC Guidelines are recommended to review these new 2006 IPCC Guidelines and to continue to monitor the development of newer guidelines and supplemental documents by IPCC.

In addition to the IPCC Guidelines, clients with projects of significant GHG emissions may depending on the type and sector of the project to best meet the objective of estimating and reporting GHG emissions, refer to the several internationally-recognized greenhouse gas emissions methodologies which can be found in the Reference section.

Illustrative examples of project activities that may result in potentially significant GHG emissions (100,000 metric ton CO_2 equivalent per year or more) have been included in the following table:

Sector / Project	**Projects with 100,000 metric ton CO_2 equivalent per year**	**Assumptions**
A: Direct Emissions		
A-(i) Energy (Fossil Fuel Combustion)		
Coal-fired combustion facility	Coal consumption - 45,000 ton/yr (or 1,100 TJ/yr)	Emission factor – 25.8 tC/TJ, Fraction of carbon oxidized – 0.98, Net calorific value – 24.05 TJ/1,000ton
Oil-fired combustion facility	Oil consumption - 32,000 ton/yr (or 1,300 TJ/yr)	Emission factor – 21.1 tC/TJ, Fraction of carbon oxidized – 0.99, Net calorific value – 40.19 TJ/1,000ton
Gas-fired combustion facility	Gas consumption - 36,000 ton/yr (or 1,800 TJ/yr)	Emission factor – 15.3 tC/TJ, Fraction of carbon oxidized – 0.995, Net calorific value – 50.03 TJ/1,000ton
A-(ii) Energy (Electricity Generation)		
Coal-fired power generation	Generating Capacity - 18MW	World average emission factor in 2001-2003 – 893 gCO_2/kWh, Annual capacity factor – 70%
Oil-fired power generation	Generating Capacity - 25MW	World average emission factor in 2001-2003 – 659 gCO_2/kWh, Annual capacity factor – 70%
Gas-fired power generation	Generating Capacity - 41MW	World average emission factor in 2001-2003 – 395 gCO_2/kWh, Annual capacity factor – 70%
A-(iii) Energy (Coal Mining)		
Underground coal mining	Coal production - 370,000	Emission factor – 17.5m^3 CH_4/ton of coal, 0.67

		ton coal/yr	$GgCH_4$/million m^3
	Surface coal mining	Coal production - 2,600,000 ton coal/yr	Emission factor – 2.45m^3 CH_4/ton of coal, 0.67 $GgCH_4$/million m^3
A-(iv) Heavy Industry			
	Cement production	Cement production - 201,000 ton cement/yr	Emission factor – 0.4985 tCO_2/t cement
	Iron and steel production	Iron / steel production - 63,000 ton iron or steel/yr	Emission factor – 1.6 tCO2/t iron or steel
A-(v) Agriculture			
	Domestic livestock (dairy cattle, Latin America)	Livestock - 74,000 cattle	Emission factor – 59 $kgCH_4$/head/yr
	Domestic livestock (dairy cattle, Africa)	Livestock- 118,000 cattle	Emission factor – 37 $kgCH_4$/head/yr
A-(vi) Forestry / Land Use Change			
	Conversion of fast growing hardwoods tropical forest	Conversion area: 4,400 ha	Annual average accumulation of dry matter as biomass – 12.5 ton dm/ha/yr, carbon fraction of dry matter – 0.5
	Conversion of Douglas fir temperate forest	Conversion area: 9,100 ha	Annual average accumulation of dry matter as biomass – 6.0 ton dm/ha/yr, carbon fraction of dry matter – 0.5
A-(vii) Oil and Gas Production (Flaring only)			
	Natural Gas Production	83,000 million m^3/yr	CO_2 emission factor of 1.2E-03 Gg per million m^3 gas production. Source: IPCC Guidelines for National Greenhouse Gas Inventories, Table 4.2.5 (2006)
	Oil Production	2.4 million m^3/yr	CO_2 emission factor of 4.1E-02 Gg per thousand m^3 oil production. Source: IPCC Guidelines for National Greenhouse Gas Inventories, Table 4.2.5 (2006)
	Associated Gas Flaring	1,400 million standard cubic feet (SCF) gas flaring/yr	American Petroleum Institute (API) Combustions Emissions Estimation Methods, Exhibit 4.8 (2004)
B: Indirect Emissions (from Purchased Electricity)			
	Average Generation Mixture	Electricity consumption - 200 GWh/yr	World average emission factor in 2001-2003 – 494 gCO_2/kWh
	Coal-fired generation	Electricity consumption - 110 GWh/yr	World average emission factor in 2001-2003 – 893 gCO_2/kWh
	Oil-fired generation	Electricity consumption - 150 GWh/yr	World average emission factor in 2001-2003 – 659 gCO_2/kWh
	Gas-fired generation	Electricity consumption - 250 GWh/yr	World average emission factor in 2001-2003 – 395 gCO_2/kWh

Note: Assumptions are from (i) Revised 1996 and 2006 IPCC Guidelines for National Greenhouse Gas Inventories, (ii) IEA Statistics – CO_2 Emissions from Fuel combustion 1971-2003, and (iii) IEA Energy Statistics Manual, 2004. These levels are for illustrative purpose only and not to be used as threshold to determine whether projects exceed 100,000 metric ton CO_2 equivalent per year.

Evaluation of greenhouse gas emissions performance:

Clients with projects having significant GHG emissions are recommended to annually evaluate the following where necessary statistics are available for the operating country:

1. The project's greenhouse gas emissions relative to the host country total national emissions to understand the magnitude of its own emissions

2. The project's greenhouse gas emissions performance relative to the good international practice performance / host country national average performance
3. The annual trend of the project's greenhouse gas emissions performance over time to monitor deterioration from the originally designed performance
4. Opportunities to further improve the project's greenhouse gas emissions performance

Greenhouse gas emission performance indicators commonly used for evaluating items 2 and 3 above include intensity ratio indicators such as:

- Electricity generation: kg-CO_2 equivalent per kWh electricity generated
- Steel production: tons of CO_2 equivalent per ton of crude steel produced
- Cement production: tons of CO_2 equivalent per ton of clinker produced; etc

Clients with projects producing significant GHG emissions are also recommended to evaluate (i) direct emissions from the facilities that they own or control within the physical project boundary and, if feasible and relevant, and (ii) major indirect emissions occurring outside the project boundary (e.g. GHG emissions from purchased electricity). This will help the client to formulate a comprehensive strategy to reduce greenhouse emissions. Emissions associated with projects that have an impact on land use and forests should be evaluated as part of the direct emissions. The client should also compare the gross emissions from the project and the gross emissions from an alternative project to determine the net emissions impact by the project. This comparison will help to identify the feasibility of additional carbon financing. Detailed guidance for carbon financing is available from the Clean Development Mechanism Executive Board.

References

- *IFC's Environmental, Health and Safety Guidelines* (IFC) – technical guidance informing those parts of the new policy structure related to environmental, health and safety issues. http://www.ifc.org/ifcext/enviro.nsf/Content/EnvironmentalGuidelines

Several of the requirements set out in the Performance Standard relate to the following international agreements and guidelines:

Guidance on Pollutant Release and Transfer Registers can be found in:

- *International Register of Potentially Toxic Chemicals of the United Nations Environment Programme* (Instituted by UNEP Chemicals) – data on environmental releases and transfers of toxic chemicals from industrial facilities. http://www.chem.unep.ch/prtr/Default.htm

Guidance on Long-range Transboundary Air Pollution can be found in:

- *Convention on Long-range Transboundary Air Pollution* (UNECE, 1979) provides a framework for controlling and reducing the damage to human health and the environment caused by transboundary air pollution. http://www.unece.org/env/lrtap

Various examples of cleaner production are being compiled by international organizations such as:

- United Nations Environmental Program (UNEP)
- United Nations Industrial Development Organization (UNIDO)
- Asian Productivity Organization (APO)

Guidance on waste and hazardous materials can be found in:

- *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal* (UNEP, 1989) provides assistance and guidelines on legal and technical issues, gathers statistical data, and conducts training on the proper management of hazardous waste http://www.basel.int/index.html
    - Supporting information to the Basel Convention are available at: http://www.basel.int/meetings/sbc/workdoc/techdocs.html
- *Stockholm Convention on Persistent Organic Pollutants* (UNEP, 2001) promotes the reduction or elimination of releases of POPs through intentional and/or unintentional production and use of chemicals, and from stockpiles and wastes. http://www.pops.int/
    - Draft Guidelines on Best Available Techniques and Provisional Guidance on Best Environmental Practices relevant to Article 5 and Annex C of the Stockholm Convention on Persistent Organic Pollutants

- *Standardized Toolkit for the Identification and Quantification of Dioxin and Furan Releases* (UNEP Chemicals, 2005) provides methodology to aid countries in developing their inventories to estimate releases of PCDD/PCDF and reviewing these inventories. http://www.pops.int/documents/guidance/

- *Montreal Protocol on Substances that Deplete the Ozone Layer* (UNEP, 2000) sets targets for reducing the production and consumption of ozone depleting substances.
  http://hq.unep.org/ozone/Montreal-Protocol/Montreal-Protocol2000.shtml

- Rotterdam Convention on the Prior Informed Consent for Certain Hazardous Chemicals and Pesticides in International Trade (UNEP, revised 2005) - procedure for certain hazardous chemicals and pesticides in international trade (Annex III).
  http://www.pic.int/home.php?type=t&id=49

- *Marpol 73/78 - International Convention for the Prevention of Pollution from Ships, 1973*, as modified by the Protocol of 1978 relating thereto (International Maritime Organization, 1973/1978) - prevention of pollution of the marine environment by ships from operational or accidental causes.
  http://www.imo.org/Conventions/contents.asp?doc_id=678&topic_id=258

For guidance on minimizing the occurrence and harmful effects of technological accidents and environmental emergencies:

- *APELL* - Awareness and Preparedness for Emergencies on a Local Level (UNEP) – provides technical reports and other materials to assist disaster prevention and response planning in vulnerable areas.
  http://www.uneptie.org/pc/apell/

In addition, the requirements set out in the Performance Standard on Ambient Conditions relate to the following Internationally Recognized Ambient Quality Guidelines and Standards:

- Air Quality Guidelines – Global Update 2005 (World Health Organization, 2006)
  http://www.euro.who.int/Document/E90038.pdf

- *Guidelines for Safe Recreational Water Environments* - Volume 1. Coastal and Fresh Waters (World Health Organization, 2003) describes the present state of knowledge regarding the impact of recreational use of coastal and freshwater environments upon the health of users.
  http://www.who.int/water_sanitation_health/bathing/srwe1/en/

- *Guidelines for Drinking-Water Quality* - Third Edition (World Health Organization, 2004) sets worldwide basis for regulation and standard setting to ensure the safety of drinking-water. http://www.who.int/water_sanitation_health/dwq/gdwq3/en/

- *Guidelines for Community Noise* (World Health Organization, 1999) provide guidance to environmental health authorities and professional trying to protect people from the harmful effects of noise in non-industrial environments. http://www.who.int/docstore/peh/noise/guidelines2.html

- *Recommendations of the International Commission on Radiological Protection* - ICRP Publication 60. (International Commission on Radiological Protection, 1991) intended to help regulatory and advisory agencies deal with ionizing radiation and with the protection of man. http://www.icrp.org

- *International Basic safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources* - Safety Series No. 115 (International Atomic Energy Agency, 1996) provides basic requirements for protection against the risks associated with exposure to ionizing radiation and for the safety of radiation sources that may deliver such exposure. http://www-pub.iaea.org/MTCD/publications/PDF/SS-115-Web/Pub996_web-1a.pdf

- *Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (Up To 300 GHz)* (International Commission on Non-Ionizing Radiation Protection, 1998) establishes guidelines for limiting electromagnetic field exposure to protect against known adverse health affects http://www.icnirp.de/documents/emfgdl.pdf

Additional reference to protection against radiation:

IAEA Safety Standards for protecting people and the environment published 2006 provides safety fundamentals/principals.

http://www-pub.iaea.org/MTCD/publications/PDF/Pub1273_web.pdf

In addition, the requirements set out in the Performance Standard on Greenhouse Gas Emissions relate to the following Internationally Recognized Guidelines and Standards:

- *United Nations Framework Convention on Climate Change* (UN, 1994) sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change. http://www.unfccc.int

  - *Kyoto Protocol* (UN, 1997) sets individual, legally-binding targets to limit or reduce greenhouse gas emissions in order to pursue the objectives of the UNFCCC. http://unfccc.int/essential_background/kyoto_protocol/items/2830.php

    - *Clean Development Mechanism* (UN) to assist Parties not included in Annex I in achieving sustainable development and in contributing to the ultimate objective of the UNFCCC, and to assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments. http://unfccc.int/kyoto_mechanisms/cdm/items/2718.php

    - *Joint Implementation* (UN) - an Annex I Party may implement an emission-reducing project or a project that enhances removals by sinks in the territory

of another Annex I Party and count the resulting emission reduction units towards meeting its own Kyoto target.
http://unfccc.int/kyoto_mechanisms/ji/items/1674.php

- *Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories* (Intergovernmental Panel on Climate Change,2006) - methodologies for estimating anthropogenic emissions by sources and removals by sinks of greenhouse gases" in calculation of legally-binding targets during the first commitment period.
http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.htm

Internationally-recognized greenhouse gas emissions methodologies:

- World Business Council for Sustainable Development (WBCSD) / World Resources Institute (WRI). Greenhouse Gas (GHG) Protocol Initiative:

  - *A Corporate Accounting and Reporting Standard, Revised Edition* (WBCSD and WRI 2004) includes additional guidance, case studies, appendices, and a new chapter on setting a GHG target.
http://www.wbcsd.org/includes/getTarget.asp?type=d&id=OTA4Mg

  - *The GHG Protocol for Project Accounting* (WBCSD and WRI, 2005) aims to be a guidance manual as well as a tool for quantifying and reporting reductions from GHG projects. The uniqueness of the protocol lies in its ability to distinguish between policy decisions and technical accounting aspects.
http://www.wbcsd.org/includes/getTarget.asp?type=d&id=MTc1MDk

- *Climate Leaders GHG Inventory Protocol* (US Environmental Protection Agency) - guidance on how to inventory and report GHG emissions.
http://www.epa.gov/climateleaders/resources/guidance.html

- *ISO 14064 Part 2 - ISO Greenhouse Gas Project Accounting Standard* (ISO, 2006) Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements
http://www.iso.org/iso/en/CatalogueDetailPage.CatalogueDetail?CSNUMBER=38382&ICS1=13&ICS2=20&ICS3=40

- *Guidelines for the Measurement and Reporting of Emissions* (UK Department of Environment and International Affairs, 2003) a set of reporting guidelines and protocols for direct participants in the UK emissions trading scheme.
http://www.defra.gov.uk/environment/climatechange/trading/uk/pdf/trading-reporting.pdf

- *Emission Inventory Improvement Program, Volume VIII – Estimating Greenhouse Gas Emissions* (US Environmental Protection Agency, 1999) currently under revision.
http://www.epa.gov/ttn/chief/eiip/techreport/

- *The Aluminum Sector Greenhouse Gas Protocol* (International Aluminum Institute, 2006) enhances and expands for the aluminum sector the World Business Council

for Sustainable Development/World Resources Institute greenhouse gas corporate accounting and reporting protocol.
http://www.world-aluminium.org/environment/climate/ghg_protocol.pdf

- *Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Gas Industry* (American Petroleum Institute, 2004) provides tools for companies measuring and reporting their greenhouse gas emissions in the oil and gas industry.
http://api-ec.api.org/policy/index.cfm?bitmask=001001004002000000#

- *Petroleum Industry Guidelines for Reporting GHG Emissions* (International Petroleum Industry Environmental Conservation Association, 2003) guidance focused specifically on the accounting and reporting of GHG emissions at the facility through the corporate level.
http://www.ipieca.org/activities/climate_change/climate_publications.php

An example on private sector disclosure of GHG Emissions:

- *Carbon Disclosure Project* - institutional investors collectively sign a single global request for disclosure of information on Greenhouse Gas Emissions.
http://www.cdproject.net/

Various sources providing national greenhouse gas emission statistics are:

- *CO_2 Emissions from Fuel Combustion* (International Energy Agency, 2006 edition) provides data to assist in understanding the evolution of the emissions of CO2 for more than 140 countries and regions by sector and by fuel.
http://www.iea.org/Textbase/publications/free_new_Desc.asp?PUBS_ID=1825

- *Carbon Dioxide Emission from Fossil Fuel Combustion* (A Compendium of Data on Global Change, 2005) provides synopses of frequently used time series of global-change data. http://cdiac.ornl.gov/trends/emis/em_cont.htm

- *Energy Information Administration* (The US Department of Energy) provides US emission data and other useful tools. http://www.eia.doe.gov/environment.html

In addition, the requirements set out in the Performance Standard on Pesticides relate to the following <Internationally Recognized Pesticides Guidelines and Standards>:

- *The International Code of Conduct on the Distribution and Use of Pesticides* (Food and Agriculture Organization of the United Nations (FAO), 2003) establishes and encourages implementation of voluntary standards of conduct associated with the distribution and use of pesticides.
http://www.fao.org/WAICENT/FAOINFO/AGRICULT/AGP/AGPP/Pesticid/

- *Pesticide Storage and Stock Control Manual* (Food and Agriculture Organization of the United Nations, 1996) useful in many countries particularly in the management and stock control of stored pesticides.
  http://www.fao.org/documents/show_cdr.asp?url_file=/docrep/V8966E/V8966E00.htm

- *Revised Guidelines on Good Labeling Practice* (Food and Agriculture Organization of the United Nations, 1995) guidance on the preparation of a label and specific advice on content and layout.
  http://www.fao.org/WAICENT/FAOINFO/AGRICULT/AGP/AGPP/Pesticid/Code/Download/label.doc

- *Guidelines for Retail Distribution of Pesticides with Particular Reference to Storage and Handling at the Point of Supply to Users in Developing Countries* (Food and Agriculture Organization of the United Nations, 1988) guidance on how to store and handle pesticides at the point of supply to users.
  http://www.fao.org/WAICENT/FAOINFO/AGRICULT/AGP/AGPP/Pesticid/Code/Download/retail.doc

- *Guidelines for the Management of Small Quantities of Unwanted and Obsolete Pesticides* - FAO Pesticide Disposal Series 7 (Food and Agriculture Organization of the United Nations, 1999) guidance on the disposal of small quantities of unusable pesticide stocks, pesticide-related waste and contaminated containers.
  http://www.fao.org/documents/show_cdr.asp?url_file=/docrep/X1531E/X1531E00.htm

- *Guidelines for Personal Protection when Working with Pesticides in Tropical Climates* (Food and Agriculture Organization of the United Nations, 1990) guidance on protecting pesticide users while ensuring they are able to work comfortably and efficiently in tropical climates.
  http://www.fao.org/WAICENT/FAOINFO/AGRICULT/AGP/AGPP/Pesticid/Code/Guide.htm

- Rotterdam Convention on the Prior Informed Consent for Certain Hazardous Chemicals and Pesticides in International Trade (UNEP, revised 2005) - procedure for certain hazardous chemicals and pesticides in international trade (Annex III).
  http://www.pic.int/home.php?type=t&id=36&sid=34

- *The WHO Recommended Classification of Pesticides by Hazard and Guidelines to Classification* (International Programme on Chemical Safety (IPCS), 2002) Provides classification system to distinguish between the more and the less hazardous forms of selected pesticides based on acute risk to human health.
  http://www.who.int/ipcs/publications/pesticides_hazard/en/