Guidance Note 3
Resource Efficiency and Pollution Prevention

January 1, 2012

Guidance Note 3 corresponds to Performance Standard 3. Please also refer to Performance Standards 1–2 and 4–8 as well as their corresponding Guidance Notes for additional information. Information on all referenced materials appearing in the text of this Guidance Note can be found in the Bibliography.

Introduction

1. Performance Standard 3 recognizes that increased economic activity and urbanization often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels.[1] There is also a growing global consensus that the current and projected atmospheric concentration of greenhouse gases (GHG) threatens the public health and welfare of current and future generations. At the same time, more efficient and effective resource use and pollution prevention[2] and GHG emission avoidance and mitigation technologies and practices have become more accessible and achievable in virtually all parts of the world. These are often implemented through continuous improvement methodologies similar to those used to enhance quality or productivity, which are generally well known to most industrial, agricultural, and service sector companies.

2. This Performance Standard outlines a project-level approach to resource efficiency and pollution prevention and control in line with internationally disseminated technologies and practices. In addition, this Performance Standard promotes the ability of private sector companies to adopt such technologies and practices as far as their use is feasible 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 more sustainable use of resources, including energy and water.***
- ***To reduce project-related GHG emissions.***

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[1] For the purposes of this Performance Standard, the term "pollution" is used to refer to both hazardous and non-hazardous chemical pollutants in the solid, liquid, or gaseous phases, and includes other components such as pests, pathogens, thermal discharge to water, GHG emissions, nuisance odors, noise, vibration, radiation, electromagnetic energy, and the creation of potential visual impacts including light.

[2] For the purpose of this Performance Standard, the term "pollution prevention" does not mean absolute elimination of emissions, but the avoidance at source whenever possible, and, if not possible, then subsequent minimization of pollution to the extent that the Performance Standard objectives are satisfied.

GN1. To achieve these objectives, clients should take into account the potential impact of their activities on 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 monitoring of impacts on the surrounding environment (i.e., changes in ambient levels), in addition to the implementation of control measures. Further information on how to address ambient conditions is provided in paragraph 11 of this Performance Standard 3 and this Guidance Note.

GN2. The potential environmental impacts associated with the emission 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 to minimize GHG emissions from core business activities to the extent that this is cost-effective.

Scope of Application

3. The applicability of this Performance Standard is established during the environmental and social risks and impacts identification process. The implementation of the actions necessary to meet the requirements of this Performance Standard is managed through the client's Environmental and Social Management System, the elements of which are outlined in Performance Standard 1.

Requirements

4. During the project life-cycle, the client will consider ambient conditions and apply technically and financially feasible resource efficiency and pollution prevention principles and techniques that are best suited to avoid, or where avoidance is not possible, minimize adverse impacts on human health and the environment.[3] The principles and techniques applied during the project life-cycle will be tailored to the hazards and risks associated with the nature of the project and consistent with good international industry practice (GIIP),[4] as reflected in various internationally recognized sources, including the World Bank Group Environmental, Health and Safety Guidelines (EHS Guidelines).

5. The client will refer to the EHS Guidelines or other internationally recognized sources, as appropriate, when evaluating and selecting resource efficiency and pollution prevention and control techniques for the project. The EHS 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 be required to achieve whichever is more stringent. If less stringent levels or measures than those provided in the EHS Guidelines are appropriate in view of specific project circumstances, the client will provide full and detailed justification for any proposed alternatives through the environmental and social risks and impacts identification and assessment process. This justification must demonstrate that the choice for any alternate performance levels is consistent with the objectives of this Performance Standard.

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[3] *Technical feasibility is based on whether the proposed measures and actions can be implemented with commercially available skills, equipment, and materials, taking into consideration prevailing local factors such as climate, geography, infrastructure, security, governance, capacity and operational reliability. Financial feasibility is based on commercial considerations, including relative magnitude of the incremental cost of adopting such measures and actions compared to the project's investment, operating, and maintenance costs.*

[4] *GIIP is 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 or regionally. The outcome of such exercise should be that the project employs the most appropriate technologies in the project-specific circumstances.*

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

GN3. Clients developing new projects or major expansions should assess and incorporate environmental aspects of the project, including total use and efficiency of use of resources, during the design phase (including project design and site selection alternatives). 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 protected areas), the expected project demand for water, and the availability of waste disposal facilities. Potential for cumulative impacts should also be reviewed.

GN4. Key environmental impacts can occur at any phase of a project and depend on a number of factors including the nature of the industry 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 these may reasonably be anticipated.

GN5. Environmental aspects of the decommissioning stage should be also considered, both during initial design and during periodic reviews undertaken as part of the Environmental and Social Management System (ESMS).

(ii) Modernizations and retrofits of existing facilities:

GN6. If a project involves or consists of existing facilities, then clients are expected to evaluate how to meet the requirements of Performance Standard 3, and seek to improve performance through mutually agreed milestones included in the Environmental and Social Action Plan (ESAP).

GN7. Clients with existing operations should assess investment to improve environmental and risk management to a level consistent with the objectives of this Performance Standard, by performing relevant studies such as industrial risk assessment or hazard and operability studies, taking into account facility operations at full load under routine circumstances, including possible intermittent exceedances during startups, shutdowns, and warm-up periods.

GN8. The client should refer to the World Bank Group Environmental, Health and Safety Guidelines (EHS Guidelines) together with other internationally recognized sources when evaluating and selecting resource efficiency and pollution prevention and control techniques for the project. The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable at reasonable cost by commercially available technology. The discharged 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 or measures 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 Sustainable Management of Living Natural Resources under Performance Standard 6.

GN9. Clients whose projects have significant emissions or whose operations are in already degraded environments must also strive to improve their performance beyond the performance levels and measures articulated in the EHS Guidelines with due consideration of airshed and watershed assimilative capacity where known.

Resource Efficiency

6. The client will implement technically and financially feasible and cost effective[5] measures for improving efficiency in its consumption of energy, water, as well as other resources and material inputs, with a focus on areas that are considered core business activities. Such measures will integrate the principles of cleaner production into product design and production processes with the objective of conserving raw materials, energy, and water. Where benchmarking data are available, the client will make a comparison to establish the relative level of efficiency.

[5] *Cost-effectiveness is determined according to the capital and operational cost and financial benefits of the measure considered over the life of the measure. For the purpose of this Performance Standard, a resource efficiency or GHG emissions reduction measure is considered cost-effective if it is expected to provide a risk-rated return on investment at least comparable to the project itself.*

GN10. The terms "Cleaner Production" and "Resource Efficiency" refer to the concept of integrating pollution reduction into the design of a product and associated production processes, or adopting an alternative production process. This involves continuous application of an integrated preventive environmental strategy to products, processes, and services in order to increase overall efficiency and reduce risks to humans and the environment by conserving raw materials, water and energy, and reducing or eliminating the use of toxic and hazardous raw materials,[GN1] and is considered to be good international industry practice. Well designed and implemented Cleaner Production projects, of which energy and water efficiency measures are a sub-set, can be highly cost-effective and often have a higher internal rate of return than the larger project to which they are applied. Almost all industrial and commercial enterprises can improve their operations through this methodology.

GN11. This clause of Performance Standard 3 refers to the core business activities[GN2] of the client. While Cleaner Production could result in cost and environmental benefits in non-core business activities, this is not required by Performance Standard 3. It is also not required to implement all technically feasible Cleaner Production measures, since this could lead to diminishing returns and inappropriate use of capital resources; the cost-effectiveness test should be taken into account.

GN12. The client should keep up to date on Cleaner Production techniques applicable to its project sector and apply them to the design of the project when technically and financially feasible and cost-effective. See Bibliography for various Cleaner Production examples. Additional guidance is provided in the General and Industry Sector EHS Guidelines. In existing facilities it may be appropriate for clients to commission external experts to undertaken Cleaner Production/Resource Efficiency studies. Such studies frequently identify no cost and low cost savings that exceed the cost of the study, as well as other highly cost-effective measures.

GN13. In many industrial and commercial sectors, where the unit of output can be readily defined, such as process industry or where resource consumption is dominated by building services, widely accepted

[GN1] United Nations Environment Programme (UNEP).
[GN2] Core business activities are those that are essential to the operation of the client's business and without which the client's business would not be viable.

benchmarks are available which describe performance in quantitative terms. For example, process energy use per tonne of product is often an accepted benchmark. Similarly, building benchmarks could refer to energy or water use per guest-night in a hotel, or energy use per unit area, in other building types, correcting for climatic variations. When these benchmarks are available, project performance that meets benchmark expectations will be taken as demonstration that the project meets this Performance Standard requirement. However, certain industrial and commercial operations, for example assembly or machining processes, do not readily lend themselves to benchmarking.

GN14. Projects using brand new machinery should reflect internationally recognized good industry practice in resource efficiency while taking account of legitimate project-specific variations from best practice.[GN3] In energy intensive sectors and when new process machinery is sourced from international vendors, the expectation is that designs will meet best practice where this is established. When a client invests in an existing manufacturing operation, or uses second-hand equipment it may not always be possible to meet best practice standards, due to physical or cost restraints. Consideration should be given to the technical and financial feasibility and cost-effectiveness of proposed measures.

GN15. Where alternative capital equipment offers have different levels of resource efficiency, the client will be expected to show that the alternatives analysis and equipment selection process did take account of resource efficiency and examined the cost-effectiveness of alternative offers. This means that when comparison is made between a low capital cost offer for inefficient equipment and a higher cost offer for more efficient equipment, the client should examine the internal rate of return of the operational cost savings of the higher capital cost option on the additional capital cost of that option.

Greenhouse Gases

7. In addition to the resource efficiency measures described above, the client will consider alternatives and implement technically and financially feasible and cost-effective options to reduce project-related GHG emissions during the design and operation of the project. These options may include, but are not limited to, alternative project locations, adoption of renewable or low carbon energy sources, sustainable agricultural, forestry and livestock management practices, the reduction of fugitive emissions and the reduction of gas flaring.

8. For projects that are expected to or currently produce more than 25,000 tonnes of CO_2-equivalent annually,[6] the client will quantify direct emissions from the facilities owned or controlled within the physical project boundary,[7] as well as indirect emissions associated with the off-site production of energy[8] used by the project. Quantification of GHG emissions will be conducted by the client annually in accordance with internationally recognized methodologies and good practice.[9]

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[6] *The quantification of emissions should consider all significant sources of greenhouse gas emissions, including non-energy related sources such as methane and nitrous oxide, among others.*

[7] *Project-induced changes in soil carbon content or above ground biomass, and project-induced decay of organic matter may contribute to direct emissions sources and shall be included in this emissions quantification where such emissions are expected to be significant.*

[8] *Refers to the off-site generation by others of electricity, and heating and cooling energy used in the project.*

[9] *Estimation methodologies are provided by the Intergovernmental Panel on Climate Change, various international organizations, and relevant host country agencies.*

[GN3] Such "legitimate variations" could include project location, climatic variations, which can be expressed as heating or cooling degree days, or changes in resource prices compared with reference cases, recognizing that some definitions of best practice (for example the IPPC Best Available Techniques) include cost-effectiveness tests.

GN16. It is widely considered that anything that is worth managing must first be measured. Quantification of GHG emissions is the first step in managing and ultimately reducing these emissions in a cost-effective manner, as required by Performance Standard 3. The gathering of data needed to facilitate a client's GHG emissions calculation is likely to provide greater transparency to the consumption and cost of utilities, and comparison between different sites' performance; activities that of themselves often drive economies. Quantification will also equip clients to participate in carbon finance programs, and prepare them for possible future emissions trading regimes. Performance Standard 3 also recognizes the diminishing returns that occur at small-sized enterprises and consequently has set an emissions threshold below which GHG quantification is not required. Quantification of GHGs at the project level is part of good international industry practice from an emissions inventory management perspective. However, such quantification is undertaken on a voluntary basis by companies according to their business needs and is not related to international climate negotiations.

GN17. Direct emissions of GHGs from the client's operations and arising from within the physical boundary of the project (including Associated Facilities where present) are referred to as Scope 1 emissions, while those associated with off-site production of energy used by the project are Scope 2 emissions. There are occasions where emissions arise from within a client's site, but not from the client's operations: such emissions should not be included in this GHG quantification. Examples include emissions from aircraft using the client's airport, or emissions from vehicles using a toll road. Similarly, emissions arising from future combustion of fossil fuel would not be attributed to producers of the fuels (e.g., a hydrocarbons extraction, transport or refining project). When CO_2 emissions result from fossil fuel use, these emissions may be quantified through knowledge of fuel use. Estimation methodologies for other emission sources are available (see Annex A and Bibliography).

GN18. Indirect emissions associated with the production by others of electrical energy used by the project can be estimated by using a national average of GHG emissions performance for electricity generation (e.g., national average of CO_2 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 CO_2 emissions per unit of electricity generated for the utility from which the project purchases electricity). Similarly, project-specific data should be used to account for GHG emissions associated with purchases of heating or cooling energy produced by third parties. See Bibliography for several sources providing statistics on national average GHG emissions. Annex A identifies electrical generation capacity by fuel type associated with emission of 25,000 tonnes per year of CO_2 equivalent.

GN19. Although not a formal requirement under Performance Standard 3, 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. See Bibliography for an example.

GN20. Many examples exist of cost-effective GHG-reducing measures. Options may include, but are not limited to product changes to reduce material use, such as lightweight glass containers or near net shape casting in industry, sustainable agricultural practices (e.g., direct drilling and optimization of nitrogen fertilizer in agriculture), material recycling (for example of metals, glass or paper), use of cement additives, use of low-carbon fuels, GHG leakage avoidance or minimization, use of low global warming potential (GWP)[GN4] chemicals, reduction of gas flaring, landfill gas collection and combustion, and multiple energy efficiency and renewable energy measures. Examples of energy efficiency measures include more energy efficient electricity generation, cogeneration of heat and power, tri-generation of heat, power and cooling, heat recovery, process changes, enhanced process control, leak elimination,

[GN4] For example, being aware that refrigerant leakage is an issue, specify a low GWP refrigerant.

insulation, and the use of more energy efficient demand-side equipment (e.g., electric motors, compressors, fans, pumps, heaters, lighting fixtures, etc.). Further guidance is provided in the General EHS Guidelines. Examples of renewable energy sources include solar power or heat generation, hydro, wind, certain types of geothermal, and biomass. Biomass-based renewable energy systems can often be combined with pollution control devices (for example anaerobic digestion of liquid effluents) and can create useful energy from organic waste. This can allow the carbon contained in this waste to be released to the atmosphere as carbon dioxide rather than as methane, a much more powerful GHG. Certain forms of agriculture and forestry can sequester large quantities of carbon dioxide from the atmosphere. Carbon Capture and Storage (CCS) has potential to remove large quantities of carbon dioxide from large concentrated point sources such as power stations or cement kilns. Additional GHG-reducing measures, such as destruction of high GWP chemicals, can be attractive if supported by carbon finance schemes.

GN21. The six GHGs of most concern to the United Nations Framework Convention on Climate Change are:

(i) Carbon dioxide (CO_2) (GWP = 1)
(ii) Methane (CH_4) (GWP = 21)
(iii) Nitrous oxide (N_2O) (GWP = 310)
(iv) Hydrofluorocarbons (HFCs) (GWPs from 140 to 11,700)
(v) Perfluorocarbons (PFCs) (GWPs from 6,500 to 9,200)
(vi) Sulphur hexafluoride (SF_6) (GWP = 23,900)

GN22. Carbon dioxide is the most significant of these GHGs, accounting for 77 percent of anthropogenic emissions. The next most significant GHG is methane, contributing to 14 percent of anthropogenic emissions, followed by nitrous oxide at 8 percent of anthropogenic emissions.[GN5] HFCs are commonly used as refrigerants and solvents and contribute to global warming when released from contained systems, for example through refrigerant leakage. PFCs are used in electronics manufacture and are formed in the aluminum refining process. Sulphur hexafluoride is used as a dielectric medium in the electrical industry as well as an inert gas in the magnesium industry and in other specialized industrial applications.

GN23. CO_2 emissions are dominated by fossil fuel combustion, but CO_2 emissions also arise from deforestation and decay of biomass, soil conversion and from certain industrial processes involving calcination of limestone (e.g., cement manufacturing) and oxidation of carbon (e.g., steelmaking). Methane is emitted during oil, gas and coal extraction, refining and processing, from livestock, rice cultivation and waste management processes. Most nitrous oxide emissions result from soil cultivation, though the compound is also emitted during combustion and by certain industrial processes. For illustrative examples of project activities that may result in potentially significant emissions of GHGs, see Annex A.

GN24. Examples of sectors that have potentially significant emissions of GHGs include energy, transport, heavy industry, building materials, agriculture, forest products 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 GHGs, (iii) promotion of sustainable forms of agriculture and forestry, (iv) promotion, development and increased use of renewable forms of energy, (v) CCS technologies, and (vi) limitation and/or reduction of methane

[GN5] Intergovernmental Panel on Climate Change, 2007: Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the IPCC. Data refer to 2004.

emissions through recovery and use in waste management, as well as in the production, transport and distribution of energy (coal, oil, and gas). Product changes can bring about significant reductions in GHG emissions, for example in blended cement highly GHG-intensive clinker is mixed with other materials. Carbon finance may create additional funding sources for pursuing reduction and control options.

Water Consumption

9. When the project is a potentially significant consumer of water, in addition to applying the resource efficiency requirements of this Performance Standard, the client shall adopt measures that avoid or reduce water usage so that the project's water consumption does not have significant adverse impacts on others. These measures include, but are not limited to, the use of additional technically feasible water conservation measures within the client's operations, the use of alternative water supplies, water consumption offsets to reduce total demand for water resources to within the available supply, and evaluation of alternative project locations.

GN25. The intent of this clause of Performance Standard 3 is that clients' projects should not cause or contribute to unacceptable water stress on third parties (including local communities).

GN26. When a project is a significant net consumer of water, or contributes to depletion of water resources to the extent that third parties' ability to access water is adversely affected, then the client shall reduce the project's water consumption to a level at which these adverse impacts are adequately mitigated, as determined by a suitable community engagement process. Actions that the client should consider to achieve this objective include but are not limited to re-siting of the project, additional resource efficiency measures within the project site (e.g., reverse osmosis-based water recovery, dry cooling) in addition to those necessary to satisfy paragraph 6 of Performance Standard 3, alternative provision of water, and water consumption offsets outside the project boundary. In this context water consumption offsets should be understood to be measures to reduce others' consumption of water from the same resource as that used by the project by an amount such that adverse project effects as described earlier in this paragraph are mitigated. For example, an industrial enterprise could help a community to reduce its water consumption through leak repair, while maintaining quality of service, thus "releasing" water for use by the industrial enterprise.

GN27. If it is not technically feasible to mitigate adverse impacts adequately at the proposed project site then an alternative project site should be selected. If the cost of the technical measures required to meet the Performance Standard objective makes the project unviable, then an alternative project site should be selected.

GN28. This Performance Standard requirement does not preclude water abstraction at a rate exceeding recharge. However, any client who proposes to abstract such quantities of water will be expected to show that such abstraction does not cause adverse effects to such other users of the water that exist or can reasonably be expected to move into the area of influence of the project.

Pollution Prevention

10. The client will avoid the release of pollutants or, when avoidance is not feasible, minimize and/or control the intensity and mass flow of their release. This applies to the release of pollutants to air, water, and land due to routine, non-routine, and accidental circumstances with the potential for local, regional, and transboundary impacts.[10] Where historical pollution such as land or ground water contamination exists, the client will seek to determine whether it is responsible for mitigation measures. If it is determined that the

client is legally responsible, then these liabilities will be resolved in accordance with national law, or where this is silent, with GIIP.[11]

11. To address potential adverse project impacts on existing ambient conditions,[12] the client will consider relevant factors, including, for example (i) existing ambient conditions; (ii) the finite assimilative capacity[13] of the environment; (iii) existing and future land use; (iv) the project's proximity to areas of importance to biodiversity; and (v) the potential for cumulative impacts with uncertain and/or irreversible consequences. In addition to applying resource efficiency and pollution control measures as required in this Performance Standard, when the project has the potential to constitute a significant source of emissions in an already degraded area, the client will consider additional strategies and adopt measures that avoid or reduce negative effects. These strategies include, but are not limited to, evaluation of project location alternatives and emissions offsets.

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[10] *Transboundary pollutants include those covered under the Convention on Long-Range Transboundary Air Pollution.*

[11] *This may require coordination with national and local government, communities, and the contributors to the contamination, and that any assessment follows a risk-based approach consistent with GIIP as reflected in the EHS Guidelines.*

[12] *Such as air, surface and groundwater, and soils.*

[13] *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.*

GN29. The client should monitor emissions 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, scale and variability 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 (see Bibliography). Monitoring emissions can benefit clients by: (i) demonstrating their compliance with environmental permits or other legal obligations, (ii) providing information to evaluate project performance and determine if corrective actions are necessary, (iii) helping to identify opportunities for further improvement, and (iv) making data available for analysis of actual incremental impacts on the ambient levels (especially for projects with potentially significant emissions impacts).

GN30. 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 and indicators within their ESMS 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).

GN31. The ESMS 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 better operational, environmental, or financial performance through, for example, reductions in energy and/or water consumption or solid/liquid waste production per unit of industrial output.

GN32. 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 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. See Bibliography for additional information on pollutant release and transfer registers.

GN33. Clients shall address contamination of land or ground water even if such contamination occurred many years earlier. Where such contamination is identified, the client should seek to determine who has the legal liability to manage this contamination. This liability will vary according to circumstances. The client may bear this responsibility due to its own past actions or inactions, or may have taken on this liability when acquiring the site. In other cases, contamination may have been identified and provision made legally to isolate the client from such liability when acquiring the site. If the client has responsibility to manage such contamination, then this shall be done in a manner satisfying the Performance Standard 3 objective to avoid or minimize adverse impacts on human health and the environment. Contamination management options will be site-specific, should be developed in consultation with other stakeholders, and may include contamination containment, isolation/buffer zones as well as mitigation.

Assimilative Capacity of the Environment

GN34. The client should assess the assimilative capacity of the receiving environment based upon air and water quality objectives, where known.

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

GN35. 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 or local 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). Receiving water quality standards may be established on a site-by-site basis and will depend on receiving water quality objectives.

GN36. 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. See Bibliography for links to internationally recognized ambient quality guidelines and standards (including those published by the World Health Organization). The project should not normally consume more than 25 percent of the assimilative capacity between the pre-project case and the relevant ambient quality guideline standards.

The General EHS Guidelines gives further guidance on this matter, including cases where ambient quality guidelines are exceeded in the pre-project case.

GN37. For projects that would discharge effluents into receiving water bodies lacking assimilative capacity, zero discharge systems and offsets shall be considered.

(ii) Modernizations and retrofits of existing facilities:

GN38. Where a project that is expected to produce potentially significant emissions of pollutants involves the 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 the 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:

GN39. Clients with projects whose area of influence includes ecologically sensitive areas such as national parks or providers of ecosystem services should implement measures to avoid or minimize incremental impacts of the projects.

> ***Wastes***
> ***12. The client will avoid the generation of hazardous and non-hazardous waste materials. Where waste generation cannot be avoided, the client will reduce the generation of waste, and recover and reuse waste in a manner that is safe for human health and the environment. Where waste cannot be recovered or reused, the client will treat, destroy, or dispose of it in an environmentally sound manner that includes the appropriate control of emissions and residues resulting from the handling and processing of the waste material. If the generated waste is considered hazardous,[14] the client will adopt GIIP alternatives for its environmentally sound disposal while adhering to the limitations applicable to its transboundary movement.[15] When hazardous waste disposal is conducted by third parties, the client will use contractors that are reputable and legitimate enterprises licensed by the relevant government regulatory agencies and obtain chain of custody documentation to the final destination. The client should ascertain whether licensed disposal sites are being operated to acceptable standards and where they are, the client will use these sites. Where this is not the case, clients should reduce waste sent to such sites and consider alternative disposal options, including the possibility of developing their own recovery or disposal facilities at the project site.***

[14] *As defined by international conventions or local legislation.*

[15] *Transboundary movement of hazardous materials should be consistent with national, regional and international law, including the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal and the London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter.*

GN40. Because of the risks to the environment and the ever-increasing costs and liabilities associated with the management and/or disposal of waste material, Performance Standard 3 requires clients to investigate options for waste avoidance, waste recovery and/or waste disposal during the design and

operational stages of the project. The level of effort to address this requirement depends on the risks associated with the waste materials generated by the project. Clients should inquire about the location of the final disposal of their waste and whether such locations are being operated to acceptable standards 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, clients should minimize waste sent off-site and consider whether they 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 both the General and Industry Sector EHS Guidelines.

GN41. In cases where the waste treatment, storage, or disposal alternative selected has the potential to generate polluting emissions or residues, the client should apply adequate control techniques to avoid, minimize or reduce them according to the requirements of paragraphs 12 and 13 of Performance Standard 3. Further information on the environmentally sound handling and disposal of wastes can be found in the EHS Guidelines, as well as numerous publications in support of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and of the Stockholm Convention on Persistent Organic Pollutants (see the Bibliography).

GN42. The requirement to obtain chain of custody documentation means that the client should be able to demonstrate that all solid wastes sent from the project site were transported by licensed carrier to a licensed final disposal facility in a manner meeting the Performance Standard 3 objectives.

> ***Hazardous Materials Management***
> ***13. Hazardous materials are sometimes used as raw material or produced as product by the project. The client will avoid or, when avoidance is not possible, minimize and control the release of hazardous materials. In this context, the production, transportation, handling, storage, and use of hazardous materials for project activities should be assessed. The client will consider less hazardous substitutes where hazardous materials are intended to be used in manufacturing processes or other operations. 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.[16]***
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> [16] *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.*

GN43. The best way to prevent the release of hazardous materials is to avoid using them in the first place. Therefore clients should explore opportunities throughout the project life-cycle to use non-hazardous materials in place of hazardous materials. This is especially relevant where the risks arising from the materials cannot easily be prevented or mitigated under normal use and/or disposal at the end of their life cycle. Substitutions have been found, for example, for the use of asbestos in building materials, polychlorinated biphenyls (PCBs) in electrical equipment, persistent organic pollutants in pesticide formulations, and ozone depleting substances in refrigeration systems. See Bibliography for links to guidelines on ozone depleting substances. Hazards presented by a chemical are summarized by a Material Safety Data Sheet (MSDS) which should be readily available from the chemical supplier or other public sources.

GN44. 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

environmental and social risks and impacts identification process, the client should conduct a hazard analysis of its operations, and disclose information related to hazardous materials management in accordance with Performance Standards 1 and 4 and their respective Guidance Notes. Hazard analysis is often conducted in conjunction with Hazard Identification (HAZID) Hazard and Operability studies (HAZOP) Process Safety Management (PSM) and Quantitative Risk Analysis (QRA); it allows clients to systematically identify systems and procedures that could result in accidental pollutant release and quantify these risks to the extent possible, and also helps to prioritize the allocation of resources for emergency response equipment and training programs.

GN45. Clients should review the list of active ingredients included in Annexes 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 those same annexes. Persistent Organic Pollutants are chemicals that have five characteristics of environmental and public health concern: they are toxic, long-lived, and mobile; they 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 ESAP should include a phase-out plan for the client to meet Performance Standard 3 in a reasonable amount of time.

GN46. The client should also minimize the unintentional generation and release such as by incineration, of chemicals listed in Annex C of the Stockholm Convention. 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 (see Bibliography). Due to the association of polyvinyl chloride (PVC) 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 human health and the environment.

GN47. The client should also review the list of chemicals included in Annex III of the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (see Bibliography) and seek to avoid their manufacture, trade and use. The use of chemicals in this list has been banned or severely restricted in one or more national jurisdictions in order to protect human health and the environment. The list includes some pesticide formulations considered severely hazardous due to their serious health or environmental effects.

GN48. The client should also review the Montreal Protocol on Substances that Deplete the Ozone Layer. Clients should avoid manufacture and consumption of the Annex A and Annex B compounds—chlorofluorocarbons (CFCs), halons, carbon tetrachloride and 1,1,1-trichloroethane. Continued use of CFC refrigerant already present within refrigeration machinery is permitted, although in these circumstances it is good practice to minimize refrigerant leakage. While the Montreal Protocol does not anticipate complete phase out of hydrochlorofluorocarbon (HCFC) refrigerants until January 1, 2040 in Article 5 countries, in many such countries zero ozone depletion potential alternatives are already proven in use, have supporting service infrastructure and are preferred to HCFCs.

Pesticide Use and Management

14. The client will, where appropriate, formulate and implement an integrated pest management (IPM) and/or integrated vector management (IVM) approach targeting economically significant pest infestations and disease vectors of public health significance.

The client's IPM and IVM program will integrate 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 economically significant pest damage and/or disease transmission to humans and animals.

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

16. The client will design its pesticide application regime to (i) avoid damage to natural enemies of the target pest, and where avoidance is not possible, minimize, and (ii) avoid the risks associated with the development of resistance in pests and vectors, and where avoidance is not possible minimize. 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 GIIP.

17. The client will not purchase, store, use, manufacture, or trade in products that fall in WHO Recommended Classification of Pesticides by Hazard Class Ia (extremely hazardous); or Ib (highly hazardous). The client will not purchase, store, use, manufacture or trade in Class II (moderately hazardous) pesticides, unless the project has appropriate controls on manufacture, procurement, or distribution and/or use of these chemicals. These chemicals should not be accessible to personnel without proper training, equipment, and facilities to handle, store, apply, and dispose of these products properly.

GN49. 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 through the environmental and social risks and impacts identification process of the need to do so, and describe the proposed use and intended users, as well as the nature and degree of associated risks. Under these circumstances, clients should also take into consideration the potential impacts (both positive and negative) to the health and resources of nearby communities as described in Performance Standard 4 and its accompanying Guidance Note. See Bibliography for links to relevant international guidelines on hazardous chemicals.

GN50. Clients involved in 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.

GN51. 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, affected communities and the environment in accordance with the principles and requirements of Performance Standards 2, 4, and 6.

GN52. 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 (see Bibliography).

GN53. 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 (see Bibliography).

GN54. 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.

GN55. 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 and Industry Sector EHS Guidelines.

Annex A

Suggested GHG Quantifying and Monitoring Practice

Suggested GHG emissions estimation methodologies:

There are many GHG emission estimation methodologies available for use by private sector projects. The most authoritative and updated methodologies can be found in the 2006 Guidelines for National Greenhouse Gas Inventories of the Intergovernmental Panel on Climate Change (IPCC). 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.

The 2006 IPCC Guidelines build on the previous Revised 1996 IPCC Guidelines and the associated 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 that have significant GHG emissions may refer to several internationally recognized GHG estimation methodologies, which can be found in the Bibliography. Depending on the type and sector of the project the methodology that best meets the objective of estimating and reporting GHG emissions should be used.

Illustrative examples of project activities that may result in potentially significant GHG emissions (25,000 tonnes CO_2 equivalent per year or more) have been included in the following table:

Sector / Project	**Projects with 25,000 tonnes CO_2 equivalent per year**	**Assumptions**
A: Direct Emissions		
A-(i) Energy (Fossil Fuel Combustion)		
Coal-fired combustion facility	Coal consumption - 11,000 ton/yr (or 260 TJ/yr)	Emission factor – 96.9 tCO_2/TJ, Fraction of carbon oxidized – 0.98, Net calorific value – 24.05 TJ/1,000ton
Oil-fired combustion facility	Oil consumption - 8,000 ton/yr (or 320 TJ/yr)	Emission factor – 77.4 tCO_2/TJ, Fraction of carbon oxidized – 0.99, Net calorific value – 40.19 TJ/1,000ton
Gas-fired combustion facility	Gas consumption - 9,200 ton/yr (or 450TJ/yr)	Emission factor – 56.1 tCO_2/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 - 4.5MW	World average emission factor in 2007–2009 – 901 gCO_2/kWh, Annual capacity factor – 70%
Oil-fired power generation	Generating Capacity - 6.1MW	World average emission factor in 2007–2009 – 666 gCO_2/kWh, Annual capacity factor – 70%
Gas-fired power generation	Generating Capacity – 10.5MW	World average emission factor in 2007–2009 – 390 gCO_2/kWh, Annual capacity factor – 70%
A-(iii) Energy (Coal Mining)		
Underground coal mining	Coal production - 93,000 ton coal/yr	Emission factor – 17.5m^3 CH_4/ton of coal, 0.67 $GgCH_4$/million m^3

	Surface coal mining	Coal production -650,000 ton coal/yr	Emission factor – 2.45m^3 CH_4ton of coal, 0.67 $GgCH_4$/million m^3
A-(iv) Heavy Industry			
	Cement production	Cement production - 33,000 ton cement/yr	Emission factor – 0.750 tCO_2/t cement
	Iron and steel production	Iron / steel production - 16,000 ton iron or steel/yr	Emission factor – 1.6 tCO2t iron or steel
A-(v) Agriculture			
	Domestic livestock (dairy cattle, Latin America)	Livestock - 14,000 cattle	Emission factor – 63 $kgCH_4$/head/yr
	Domestic livestock (dairy cattle, Africa)	Livestock- 20,000 cattle	Emission factor – 40 $kgCH_4$/head/yr
A-(vi) Forestry / Land Use Change			
	Conversion of fast growing hardwoods tropical forest	Conversion area: 1,100 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: 2,300 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	21,000 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	600,000 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	350 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 - 50 GWh/yr	World average emission factor in 2007–2009 – 504 gCO_2/kWh
	Coal-fired generation	Electricity consumption - 28 GWh/yr	World average emission factor in 2007–2009 – 901 gCO_2/kWh
	Oil-fired generation	Electricity consumption - 38 GWh/yr	World average emission factor in 2007–2009 – 666 gCO_2/kWh
	Gas-fired generation	Electricity consumption - 65 GWh/yr	World average emission factor in 2007–2009 – 390 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, 2011 Edition, 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 25,000 tonnes CO_2 equivalent per year.

Evaluation of GHG emissions:

Clients with projects producing significant GHG emissions are required to evaluate (i) **Scope 1 Emissions:** direct emissions from the facilities that they own or control within the physical project boundary and, if feasible and relevant, and (ii) **Scope 2 Emissions:** indirect emissions associated with the project's use of energy but occurring outside the project boundary (e.g., GHG emissions from purchased electricity, heat or cooling).

Annotated Bibliography

General Guidance

IFC (International Finance Corporation). 2007. *Environmental, Health, and Safety General Guidelines.* Washington, DC: IFC. http://www1.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/ifc+sustainability/risk+management/sustainability+framework/sustainability+framework+-+2006/environmental%2C+health%2C+and+safety+guidelines/ehsguidelines. Technical guidance about the subject matter is covered in Performance Standard 3 and other performance standards. Separate sections describe air emissions and ambient air quality; energy conservation; wastewater and ambient water quality; water conservation; hazardous materials management; waste management; noise and contaminated land; among others. The technical guidance informs readers about those parts of the new policy structure related to environmental, health, and safety issues. The information is presented both generally and for 63 industrial and service sectors.

European Commission, Joint Research Centre, Institute for Prospective Technological Studies. 2011. "Reference Documents." European Commission, Seville, Spain. http://eippcb.jrc.es/reference/. The European Commission's Integrated Pollution Prevention and Control Bureau has prepared reference documents (or BREFs) that provide technical guidance about process selection and operations that—in the European Union—are considered to be examples of best available techniques (BAT). The BREFs also state environmental impacts, including those that are resource efficiency benchmarks in selected sectors and that are associated with BAT.

Climate Change and its Mitigation and Adaptation

IFC (International Finance Corporation). 2011a. "Climate Business." IFC, Washington, DC. http://www.ifc.org/climatebusiness. On its climate business website, IFC has compiled a variety of resources that are relevant to climate change mitigation adaptation.

———. 2011b. "GHG Accounting." IFC, Washington, DC. http://www.ifc.org/ifcext/climatebusiness.nsf/Content/GHGaccounting. The website discusses the Carbon Emissions Estimator Tool (CEET) and provides a link to download CEET, which is an Excel spreadsheet. The information is compatible with the Greenhouse Gas Protocol's carbon reporting methodologies.

IPCC (Intergovernmental Panel on Climate Change). 2006. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Hayama, Japan: Institute for Global Environmental Strategies. http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.htm. The guidelines may assist Parties in fulfilling their commitments under the UNFCCC on reporting on inventories of anthropogenic emissions by sources and removal by sinks of greenhouse gases not controlled by the Montreal Protocol, as agreed by the Parties.

Pachauri, Rajendra K., and Andy Reisinger, eds. 2007. *Climate Change 2007: Synthesis Report. Contributions of Working Groups I, II, and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Geneva: Intergovernmental Panel on Climate Change. http://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_synthesis_report.htm.

UN (United Nations). 1992. "United Nations Framework Convention on Climate Change." UN, Bonn, Germany. http://unfccc.int/key_documents/the_convention/items/2853.php. The document sets an overall framework for intergovernmental efforts to tackle the challenges posed by climate change.

———. 1998. "Kyoto Protocol to the United Nations Framework Convention on Climate Change." UN, Bonn, Germany. http://unfccc.int/essential_background/kyoto_protocol/items/2830.php. The protocol sets individual, legally binding targets to limit or reduce greenhouse gas emissions to pursue the objectives of the United Nations Framework Convention on Climate Change (UNFCCC). Article 6 of the protocol defines "joint implementation," which allows an Annex I party to implement an emissions-reducing project or a project that enhances removals by sinks in the territory of another Annex I party. The Annex I party may then count the resulting emission reduction units toward its own Kyoto Protocol target. For more information on joint implementation, visit http://unfccc.int/kyoto_mechanisms/ji/items/1674.php. Article 12 of the protocol defines the Clean Development Mechanism (CDM), which assists parties not included in Annex I in achieving sustainable development and in contributing to the ultimate objective of the UNFCCC. The CDM also assists parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments. For more information on CDM, visit http://unfccc.int/kyoto_mechanisms/cdm/items/2718.php.

Guidance on Energy Efficiency and Greenhouse Gas Mitigation Techniques

Many sources are available with information on energy efficiency and other greenhouse gas (GHG) mitigation techniques:

Carbon Trust. 2011. Homepage. Carbon Trust, London. http://www.carbontrust.co.uk/Pages/Default.aspx. The not-for-profit company was established by the U.K. government to help businesses and public organizations reduce their emissions of carbon dioxide into the atmosphere by improving energy efficiency and developing commercial low carbon technology.

EPA (U.S. Environmental Protection Agency). 2011. "Energy Star Program." EPA, Washington, DC. http://www.energystar.gov/index.cfm?c=home.index. Among other things, the program offers guidance on energy-efficiency opportunities in the residential, commercial, and selected industrial sectors.

IEA (International Energy Agency). 2010. *CO_2 Emissions from Fuel Combustion*. Paris: IEA. http://www.iea.org/Textbase/publications/free_new_Desc.asp?PUBS_ID=1825. The book provides data to assist in understanding the evolution of carbon dioxide emissions in more than 140 countries and regions by sector and by fuel.

OECD (Organisation for Economic Co-Operation and Development) and IEA (International Energy Agency). 2004. *Energy Statistics Manual.* Paris: OECD and IEA. http://epp.eurostat.ec.europa.eu/portal/page/portal/product_details/publication?p_product_code=NRG-2004.

U.S. Department of Energy. "U.S. Energy Information Administration." U.S. Department of Energy, Washington, DC. http://www.eia.doe.gov/environment.html. The homepage for the administration provides links to U.S. emission data and other useful tools.

U.S. Department of Energy. 2011. "Industrial Technologies Program." U.S. Department of Energy, Washington, DC. http://www1.eere.energy.gov/industry/index.html. As the lead U.S. government program, the Industrial Technologies Program works to increase energy efficiency of U.S. industry. Its website has a wealth of materials related to energy-efficiency topics, including (a) case studies, (b) generic and industry-specific technical information, and (c) software tools for the analysis of common energy-intensive industrial utilities. One can also subscribe to a newsletter.

Performance Standard Requirements Related to International Agreements and Guidelines

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

UNEP (United Nations Environment Programme). "Pollutant Release and Transfer Registers." UNEP, Geneva. http://www.chem.unep.ch/prtr/Default.htm. The International Register of Potentially Toxic Chemicals of UNEP presents data on environmental releases and transfers of toxic chemicals from industrial facilities.

Guidance on Long-Range Transboundary Air Pollution and Cleaner Production

UNECE (United Nations Economic Commission for Europe). 1979. "Convention on Long-Range Transboundary Air Pollution." UNECE, Geneva. http://www.unece.org/env/lrtap. The convention provides a framework for controlling and reducing the damage to human health and the environment caused by transboundary air pollution.

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

- APO (Asian Productivity Organization), Tokyo. http://www.apo-tokyo.org.
- UNEP (United Nations Environmental Programme), Division of Technology, Industry, and Economics, Paris. http://www.unep.fr/scp/cp/.
- UNIDO (United Nations Industrial Development Organization), Vienna, Austria. http://www.unido.org.

Guidance on Waste and Hazardous Materials

IMO (International Maritime Organization). 1973. "International Convention for the Prevention of Pollution from Ships (MARPOL)." IMO, London. http://www.imo.org/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx. As modified by subsequent protocols, the

convention covers prevention of pollution of the marine environment by ships from operational or accidental causes.

Institut International du Froid (International Institute of Refrigeration). 2005. "Summary Sheet on the Montreal Protocol." Institut International du Froid, Paris. http://www.lindegas.hu/en/images/MontrealProtocol70-6761.pdf.

Secretariat of the Basel Convention. 1989. "Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal." Secretariat of the Basel Convention, Geneva. http://archive.basel.int/index.html. The convention provides assistance and guidelines on legal and technical issues, gathers statistical data, and conducts training on the proper management of hazardous waste. Supporting information to the Basel Convention is available at http://basel.int/meetings/sbc/workdoc/techdocs.html.

Secretariat of the Stockholm Convention. 2001. "Stockholm Convention on Persistent Organic Pollutants." Secretariat of the Stockholm Convention, Geneva. http://chm.pops.int/. The convention promotes the reduction or elimination of releases of persistent organic pollutants (POPs) through the intentional or unintentional production of and use of chemicals, as well as from stockpiles and wastes.

———. 2011. "Guidelines on Best Available Techniques and Provisional Guidance on Best Environmental Practices." Secretariat of the Stockholm Convention, Geneva. http://chm.pops.int/Programmes/BAT/BEP/Guidelines/tabid/187/language/en-US/Default.aspx. The site provides guidance relevant to Article 5 and Annex C of the Stockholm Convention on Persistent Organic Pollutants.

UNEP (United Nations Environment Programme). 2000. "The Montreal Protocol on Substances that Deplete the Ozone Layer." UNEP, Nairobi. http://ozone.unep.org/pdfs/Montreal-Protocol2000.pdf. The protocol sets targets for reducing the production and consumption of ozone-depleting substances.

———. 2010. "Rotterdam Convention on the Prior Informed Consent for Certain Hazardous Chemicals and Pesticides in International Trade." UNEP, Nairobi. http://archive.pic.int/INCS/CRC7/b2)/English/K1063398CRC-7-2.pdf. The website presents the revised procedure for certain hazardous chemicals and pesticides in international trade (Annex III).

Guidance on Minimizing the Occurrence and Harmful Effects of Technological Accidents and Environmental Emergencies

OSHA (Occupational Health and Safety Administration). 2011. "Process Safety Management (PSM)." OSHA, Washington, DC. http://www.osha.gov/SLTC/processsafetymanagement/index.html. The site provides guidance on process safety management.

UNEP (United Nations Environmental Programme). n.d. "Awareness and Preparedness for Emergencies on a Local Level (APELL)." Sustainable Consumption and Production Branch, UNEP, Paris. http://www.uneptie.org/scp/sp/process/. The site provides technical reports and other materials to assist disaster prevention and response planning in vulnerable areas.

Internationally Recognized Ambient Quality Guidelines and Standards

In addition to earlier guidance, the requirements set out in the Performance Standard on Ambient Conditions also relate to the following.

Berglund, Birgitta, Thomas Lindvall, and Dietrich H. Schwela, eds. 1999. *Guidelines for Community Noise.* Geneva: WHO. http://www.who.int/docstore/peh/noise/guidelines2.html. This publication gives guidance to environmental health authorities and professionals who are trying to protect people from the harmful effects of noise in nonindustrial environments.

IAEA (International Atomic Energy Agency). 1996. "International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources." Safety Series 115, IAEA, Vienna, Austria. http://www-pub.iaea.org/MTCD/publications/PDF/SS-115-Web/Pub996_web-1a.pdf. The report 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.

ICRP (International Commission on Radiological Protection). 1991. "Annals of the ICRP: Recommendations of the International Commission on Radiological Protection." ICRP Publication 60, Pergamon Press, Oxford, U.K. http://www.icrp.org/publication.asp?id=ICRPPublication60. The recommendations are intended to help regulatory and advisory agencies deal with ionizing radiation and with the protection of humans.

International Commission on Non-ionizing Radiation Protection. 1996. "Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (Up to 300 GHz)." *Health Physics* 74 (4): 494–522. http://www.icnirp.de/documents/emfgdl.pdf. The article establishes guidelines for limiting electromagnetic field exposure to protect against known adverse health effects.

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

———. 2004. *Guidelines for Drinking-Water Quality, Volume 1: Incorporating First and Second Addenda to the Third Edition*. Geneva: WHO. http://www.who.int/water_sanitation_health/dwq/gdwq3/en/. The book sets a worldwide basis for regulation and standards to ensure the safety of drinking water.

———. 2006. "Air Quality Guidelines: Global Update 2005." WHO, Geneva. http://www.who.int/phe/health_topics/outdoorair_aqg/en/.

Additional Protection against Radiation

In addition, the requirements set out in the performance standard on GHG emissions relate to the following internationally recognized guidelines and standards.

IAEA (International Atomic Energy Agency). 2006. "Fundamental Safety Principles." IAEA Safety Standards for Protecting People and the Environment SF-1, IAEA, Vienna, Austria.
http://www-pub.iaea.org/MTCD/publications/PDF/Pub1273_web.pdf. The publication provides information on safety fundamentals and principles.

Internationally Recognized Greenhouse Gas Emissions Methodologies

The GHG Protocol is a joint initiative of the World Business Council for Sustainable Development and the World Resources Institute. For general information about the GHG Protocol, visit http://www.ghgprotocol.org. The U.S. Environmental Protection Agency's website on climate change (http://www.epa.gov/climatechange/index.html) and its website for the GHG Reporting Program (http://www.epa.gov/climatechange/emissions/ghgrulemaking.html) provide additional information on GHG emissions methodologies. Other resources include the following:

API (American Petroleum Institute). 2004. *Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Natural Gas Industry*. Austin, TX: API. http://www.api.org/ehs/climate/new/upload/2009_GHG_COMPENDIUM.pdf. The book provides companies in the oil and natural gas industry tools for measuring and reporting their GHG emissions.

DECC (U.K. Department of Energy and Climate Change) and Defra (U.K. Department for Environment, Food, and Rural Affairs). 2009. "Guidance on How to Measure and Report Your Greenhouse Gas Emissions." DECC and Defra, London.
http://www.defra.gov.uk/publications/2011/03/26/ghg-guidance-pb13309. The report provides a set of reporting guidelines and protocols for direct participants in the U.K. emissions trading scheme.

EPA (U.S. Environmental Protection Agency). 1999. "Emission Inventory Improvement Program, Volume VIII: Estimating Greenhouse Gas Emissions." EPA, Washington, DC. http://www.epa.gov/ttnchie1/eiip/techreport/volume08.

IFC (International Finance Corporation) and NCASI (National Council for Air and Stream Improvement). 2011. "The Forest Industry Carbon Assessment Tool (FICAT)." IFC and NCASI, Washington, DC. http://www.ficatmodel.org/landing/index.html. The IFC-supported tool characterizes the overall lifecycle of the GHG impact (not just that of carbon dioxide) of the forest product industry manufacturing facilities and companies.

IPIECA (International Petroleum Industry Environmental Conservation Association). 2003. "Petroleum Industry Guidelines for Reporting Greenhouse Gas Emissions." IPIECA, London. http://www.ipieca.org/publication/guidelines-greenhouse-gas-reporting-2011.
The guidance provided in this report is focused specifically on the accounting and reporting of GHG emissions, and it ranges from the facility level to the corporate level.

ISO (International Organization for Standardization). 2006. "ISO Greenhouse Gas Project Accounting Standard, Part 2." ISO 14064, ISO, Geneva.
http://www.iso.org/iso/en/CatalogueDetailPage.CatalogueDetail?CSNUMBER=38382&ICS1=13&ICS2=20&ICS3=40. The specifications provide guidance at the project level for quantifying, monitoring, and reporting GHG emission reductions or removal enhancements.

WBCSD (World Business Council for Sustainable Development) and WRI (World Resources Institute). 2004. *The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard.* Geneva, WBCSD; Washington, DC: WRI. http://www.wri.org/publication/greenhouse-gas-protocol-corporate-accounting-and-reporting-standard-revised-edition. The book includes additional guidance, case studies, appendices, and a new chapter on setting a GHG target.

———. 2005. *The GHG Protocol for Project Accounting.* Geneva, WBCSD; Washington, DC: WRI. http://www.ghgprotocol.org/files/ghgp/ghg_project_protocol.pdf. The book aims to be a 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.

———. 2011. "Calculation Tools." Geneva, WBCSD; Washington, DC: WRI. http://www.ghgprotocol.org/calculation-tools/all-tools. The site provides GHG calculation information for general industrial and commercial activities such as (a) stationary combustion, (b) purchased electricity, (c) transport or mobile sources, (d) combined heat and power plants, and (e) refrigeration and air conditioning systems. The tools also calculate GHG emissions from the following industrial sectors: aluminum, cement, iron and steel, lime, ammonia, nitric acid, chlorodifluoromethane (HCFC-22), pulp and paper, and adipic acid. Additional guidance is also available following free registration.

Example of Private Sector Disclosure of GHG Emissions

Under the Carbon Disclosure Project, institutional investors collectively sign a single global request for disclosure of information on greenhouse gas emissions. For more information about this private sector program, visit http://www.cdproject.net.

Guidance on Safe Handling of Pesticides

FAO (Food and Agriculture Organization of the United Nations). 1990. "Guidelines for Personal Protection when Working with Pesticides in Tropical Climates." FAO, Rome. http://www.fao.org/ag/AGP/AGPP/Pesticid/Code/Download/PROTECT.pdf. The document provides guidance on protecting pesticide users while ensuring that they are able to work comfortably and efficiently in tropical climates.

———. 1995. "Guidelines on Good Labelling Practice for Pesticides." FAO, Rome. http://www.bvsde.paho.org/bvstox/i/fulltext/fao11/fao11.pdf. The document provides guidance on preparing labels and gives specific advice on content and layout.

———. 1996. "Pesticide Storage and Stock Control Manual." FAO, Rome. http://www.fao.org/docrep/v8966e/v8966e00.htm. The manual is useful in many countries, particularly regarding the management and stock control of stored pesticides.

———. 1998. "Guidelines for Retail Distribution of Pesticides with Particular Reference to Storage and Handling at the Point of Supply to Users in Developing Countries." FAO, Rome. The document provides 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.

———. 1999. "Guidelines for the Management of Small Quantities of Unwanted and Obsolete Pesticides." FAO Pesticide Disposal 7, FAO, Rome. http://www.fao.org/docrep/X1531E/X1531E00.htm. The document provides guidance on the disposal of small quantities of unusable pesticide stocks, pesticide-related waste, and contaminated containers.

WHO (World Health Organization). 2010. "The WHO Recommended Classification of Pesticides by Hazard and Guidelines to Classification 2009." International Programme on Chemical Safety, WHO, Geneva. http://www.who.int/ipcs/publications/pesticides_hazard/en. The document provides a classification system to distinguish between the more hazardous and the less hazardous forms of selected pesticides on the basis of acute risk to human health.