Sida Evaluation 07/02

Greenhouse Gas Emission Reduction from Industry in Asia and the Pacific

S.C. Bhattacharya

Department for Infrastructure
and Economic Cooperation

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Executive Summary

The Greenhouse Gas Emission Reduction from Industry in Asia and the Pacific (GERIAP) project funded by the Swedish International Development Cooperation Agency (Sida) was coordinated by United Nations Environment Programme (UNEP) and implemented together with national focal points in nine countries, Bangladesh, China, India, Indonesia, Mongolia, the Philippines, Sri Lanka, Thailand and Viet Nam. The project had three components: capacity-building, demonstration of cleaner production and energy efficiency options in selected industrial plants and a study on barriers to improving energy efficiency.

Sida funding for the project amounted to $1,950,991. In addition, UNEP provided funds to cover all expenses related to administrative support, the secretariat office, associated facilities and project start-up activities, including recruitment of the project coordinator.

The evaluation was conducted as an in-depth evaluation using a participatory approach whereby the GERIAP project coordinator and a number of other relevant key stakeholders were consulted. In-depth, face-to-face interviews were conducted in three representative countries: Thailand, Indonesia and Viet Nam.

The evaluator concluded that the project objective was largely achieved through the following: development of the *Energy efficiency guide for industry in Asia* and capacity-building of the national focal points and industrial plants; implementation of cleaner production and energy efficiency options; dissemination of the project results and findings; and sharing of knowledge across national boundaries. Although no direct involvement of or discussions with concerned government authorities took place under the project, the project is likely to contribute indirectly to energy efficiency policy formulation in the region as a result of dissemination of the guide and project findings through national dissemination and other modes (for example, web-hosting and mailing of the guide) and direct or indirect links between the national focal points and concerned national government authorities.

Considering time and resource constraints, capacity-building of the national focal points and industrial plants was satisfactory. Availability of the guide is likely to facilitate further capacity-building after the project period. Reduction in greenhouse gas emissions in the industrial sectors of the selected countries as a result of project activities was not so significant. The evaluator, however, regards the level of greenhouse gas mitigation (1,082,284 tonnes of carbon dioxide per year) achieved through the project as satisfactory. The project has benefited from outputs (cleaner production and energy efficiency manual of the UNEP Division of Technology, Industry and Economics) and from the experiences of another regional project, the Network for Industrial Environmental Management, and its outputs will be used in other projects in the region.

A key strength of the implementation approach was the coordinated network of its national focal points. Although national-level discussions with concerned government authorities and industry representatives to develop policy guidelines did not take place as outlined in the project document, the overall implementation approach was as planned in the project document. The project adapted well to changes during implementation and undertook more activities to use surplus funds resulting from favourable exchange rates in a fruitful manner. The GERIAP secretariat was effective in facilitating and coordinating project activities.

Stakeholder participation in the project was moderately unsatisfactory. As noted above, concerned government authorities and industry representatives were not involved as suggested in the project document. The original selection of four of the nine national focal points was not satisfactory. Some of the industrial plants selected were part of multinational companies whose inclusion could not be fully

justified. The low number of participants in the awareness seminars implies that some potential stakeholders could not participate. Absence of non-participating industrial plants in the national guide launch seminars in China, India and Thailand prevented dissemination of the project findings to these key stakeholders and diminished the likelihood of their benefiting from the outputs of the project.

The financial planning and cost effectiveness of the project were highly satisfactory. Project expenditures were based on approved allocations and the project fund was managed with due diligence. Timely planning of additional activities to use surplus funds that became available enhanced the impact of the project and is commendable. Overall outputs of the project in terms of capacity-building and level of leveraged funding exceeded normal levels of expectation.

The project fits with the priorities of the participating countries regarding enhancing energy security and reducing dependence on imported energy as well as their acknowledged responsibility towards reducing emission of greenhouse gases.

The project should be replicable in other similar industrial plants and plants from other industrial sectors in the Asia-Pacific region and also in other geographical regions.

The monitoring of project progress involved:

(a) Country GERIAP teams, which were responsible for execution of national-level activities;

(b) The GERIAP secretariat, which served to coordinate or supervise project activities and to arrange or provide guidance to country teams;

(c) Advisory committee meetings to discuss problems encountered and identify corrective measures.

Overall, monitoring of the project was quite satisfactory; this involved periodic submission of progress reports by the country teams to the GERIAP secretariat in a prescribed format and reports by the secretariat to Sida and the UNEP Division of Technology, Industry and Economics.

The project has already had some impact; more impact is likely through dissemination of the guide in the future. Nevertheless, impact would have been greater if stakeholder participation had been more effective.

Considering the capacity developed by the project and likely to be further developed as a consequence of the project, and the practical benefits that this has brought about for the participating plants, the project outcomes are likely to be sustained and enhanced over time.

Considering the growing importance of cleaner production, energy efficiency and greenhouse gas mitigation, a sequel to the GERIAP project to promote those options, leading to greenhouse gas mitigation in industry in Asia, is highly recommended. The follow-up project should also include greenhouse gas mitigation through implementation of energy efficiency options under the Clean Development Mechanism. Considering the growing concern about shortages of water in many places, the scope of the project could be broadened to promote efficient use of water in industrial establishments. Thus, the overall objective of the follow-up project could be improvement of efficiency of use of resources in industries in Asia, including energy (through energy efficiency options, both under the Clean Development Mechanism and otherwise), and water and other materials (through cleaner production). Adding case studies and information on the Clean Development Mechanism methodology for industrial energy efficiency projects on the guide website and developing a methodology on efficient water use in industries are recommended for the follow-up project.

The project would then serve to promote sustainable industrial development in the participating countries through minimizing environmental impacts (air and water pollution, greenhouse gas emissions and solid waste generation), conserving scarce resources (energy and water) and improving the profitability of industrial establishments through energy saving, thereby enhancing their competitiveness.

1. Background

The industrial sector of most countries of the Asia-Pacific region has been growing fast over the last few decades. While industrial growth and the accompanying economic growth have brought about welcome social benefits, they have also resulted in a steep rise in demand for energy and other resources, leading to a host of environmental problems.

The understanding of the long-term interdependence of economic development and environmental sustainability is generally limited in most developing countries. National policymakers normally consider economic growth as a top priority and environmental threats tend to be seen as problems to be dealt with later. For most business leaders, the main focus is profit-making, and pollution control measures are often regarded as a waste of resources and effort. As a result of this attitude, environmental degradation in fast-growing economies in Asia has increased to a level where Asia is emerging as one of the most polluted regions in the world.

Environmental problems that usually receive some attention are typically those that have local impact and would attract public opposition if left unattended, such as air and water pollution. Regional or international threats, such as acid rain and climate change, receive far less attention. Climate change is too serious a threat, however, to be left unaddressed. It is one of the most challenging problems ever faced by humankind, putting a million species at risk, and may have consequences far beyond environmental degradation and economic loss.

Climate change is the result of the growing atmospheric concentration of certain gases, called greenhouse gases, which have been accumulating in the atmosphere since the beginning of the industrial revolution. Most important among these is carbon dioxide emitted from combustion of fossil fuels, which currently account for about three quarters of total world energy consumption. The most important option for addressing climate change, therefore, lies in reducing consumption of fossil fuels through their efficient use and through substitution by alternative sources of energy.

The rising global energy consumption is causing another major problem: depletion of non-renewable energy resources, particularly oil, which accounted for 38 per cent of commercial energy consumption in 2004. Some studies suggest that world oil production may peak in less than 10 years from today; if that happens, the world will face an unprecedented energy crisis (Hirsh et al., 2005).

Energy consumption in the Asia-Pacific region has been growing fast in recent years; the growth of commercial energy consumption in the region during the 1994–2004 period was about 50 per cent compared with 23 per cent for the world as a whole (BP, 2005). It has been projected that world consumption of marketed energy will grow by nearly 57 per cent over the 23-year period from 2002 to 2025; in comparison, marketed energy demand in Asia is projected to grow by 122 per cent over the same period (EIA, 2005).

There is a clear need for Asian countries to control their energy consumption growth rate to enhance their energy security; reduce emission of local air pollutants and generation of liquid and also solid wastes; and contribute towards global efforts to reduce emission of greenhouse gases.

Considering that industrial-sector growth constitutes the engine for economic development in most developing countries and is of highest priority in these countries, it is essential that the measures designed to reduce greenhouse gas emissions are not counterproductive in terms of economic development. Ideally, the measures to reduce greenhouse gas emissions from industry should not only reduce the emissions but also yield economic benefits to the industrial plants adopting them. This can be achieved if the suggested measures focus on improved efficiency in the generation and use of energy.

Energy is basic to all industrial operations, and for many companies it may be a major factor in production costs; consequently, energy saving means improved profitability. Improvement of energy efficiency in industry could also allow increased production without new capital expenditures by using existing equipment more efficiently.

The GERIAP project was launched to develop and test in practice a mechanism for encouraging company-level action to increase the efficiency of energy use in their production processes and thereby reduce associated emissions, especially of greenhouse gases. The mechanism would be based on the cleaner production concept, where the combined environmental and economic benefits that can be achieved simultaneously encourage companies to take action on their own. The initial overall expected results of the project included:

(a) An established and tested methodology for identifying and implementing greenhouse gas emission reduction measures at the company level in the iron and steel, cement and lime, pulp and paper, and chemicals sectors;

(b) Improved awareness and capacity in targeted industry sectors in the region regarding the need for production efficiency together with practical options to improve it and reduce waste and emissions through the application of the cleaner production methodology, especially in respect of energy production and consumption;

(c) Improved understanding of policy options for promoting greenhouse gas emission reduction measures in industry;

(d) Reduced greenhouse gas emissions from targeted industry sectors (in the short term, from companies participating in the project, and in the longer term, from the sectors as a whole).

The project consisted of three major components:

(a) Capacity-building, especially training of national partners;

(b) Practical demonstration and evaluation of an energy audit methodology developed under the project by carrying out audits, preparing action plans and implementing those plans in a number of industrial plants in the most energy-intensive sectors –pulp and paper, iron and steel, chemicals production, and lime and cement;

(c) Review and evaluation of national policies and measures, and recommendations for policies that can be adopted and measures that can be taken to support and encourage the adoption of energy-efficient production methods in industry.

The project was funded by Sida and coordinated and supervised by a project secretariat, headed by a project coordinator under the UNEP Division of Technology, Industry and Economics at the Regional Office for Asia and the Pacific in Bangkok. In each participating country, a national project focal point supported the implementation of project activities at country level. Consultants were contracted depending on the specific needs of the project to prepare training materials, train representatives from the national focal points, assist the national focal points in carrying out in-plant assessments, prepare reports, and so on.

Representatives from the national focal points, and also from the UNEP Division of Technology, Industry and Economics and Sida, constituted a project advisory board that met once a year to provide advice and guidance to the project secretariat and suggest corrective measures to solve problems faced during project execution.

The present evaluation is a terminal in-depth evaluation conducted at the end of the project.

2. Scope, Objective and Methodology

The objective of the present evaluation is to assess the extent to which the goals and expected objectives of the GERIAP project have been achieved in an effective and efficient manner and to provide recommendations and lessons from programme implementation to help determine whether to replicate or design new projects in the future. Annex I shows the terms of reference for the evaluation. The present evaluation report also discusses and recommends options for the future, including institutional and financial sustainability activities without the involvement of UNEP and beyond the project duration. The evaluation will cover the entire period from January 2002 to June 2006 and includes nine countries in the Asia-Pacific region (Bangladesh, China, India, Indonesia, Mongolia, the Philippines, Sri Lanka, Thailand and Viet Nam). The evaluation was conducted as a desk study in combination with field visits to three representative countries. The evaluation covered five broad issues:

How appropriate is the GERIAP model for encouraging company-level action to increase the efficiency of energy use in their production processes, thereby reducing associated emissions, especially of greenhouse gases? If inappropriate, what improvements or modifications are required? In addition, was the project design or model appropriate for the project's objective and planned results in partner countries?

To what extent was the project successful in enhancing the capacity of industry sectors and facilitating organizations in reducing greenhouse gas emissions through the efficient use of energy?

How successful was the project in fostering partnerships between industry sectors in reducing greenhouse gas emissions through energy efficiency?

To what extent was the project successful in assisting countries in formulating and implementing policies associated with reduction of greenhouse gas emissions through energy efficiency?

To what extent were the experience and lessons learned through the GERIAP project disseminated to wider audiences within the United Nations system and to national policymakers, private sector entrepreneurs, academic institutions, non-governmental organizations and the news media?

The evaluation was conducted as an in-depth evaluation using a participatory approach whereby the GERIAP project coordinator and other key stakeholders were kept informed and consulted during the evaluation.

The findings of the evaluation are based on the following:

(a) A desk review of project documents including, but not limited to:

   i) The project documents, outputs, monitoring reports (such as progress and financial reports to UNEP headquarters), progress reports, self-evaluation reports and relevant correspondence;

   ii) Review of specific products and outputs, including technical and financial models, technical information, research results, methodological guidelines, strategies and recommendations related to the wider application of the generic tools and methodological approach developed by the project;

   iii) Notes from the advisory board meetings;

   iv) Other material provided by the project secretariat, national focal points and industry partners, in both hard and soft forms;

(b) In-person interviews with project-related staff at the UNEP Regional Office for Asia and the Pacific, and the Division of Technology, Industry and Economics. In-depth, face-to-face interviews were

conducted in three representative countries: Thailand, Indonesia and Viet Nam. Annex II presents a list of people interviewed by the evaluator during visits to those three countries;

(c) Telephone interviews with Sida and UNEP Division of Technology, Industry and Economics, Paris and UNEP Headquarters staff, Nairobi;

(d) Questionnaire-based feedback from the national focal points and further telephone conversations with selected national focal points for clarification if needed. The evaluator considered the questionnaire important because of the language problems often encountered in some Asian countries involved in the project. Annex III presents a list of people contacted by telephone and e-mail. Annex IV presents the questionnaires used to collect data by telephone and during in-person interviews.

The achievements of the project were validated during the evaluation by comparing the responses of the people interviewed with the project document, for example, verifying the number of people from the national focal points trained under the training of trainers programme and checking the actual cleaner production and energy efficiency options implemented in the plants, such as recovery of lime powder dust at Lime Master Limited, where the dust used to pollute the air around the plant seriously, through the use of bag filters which not only solved the environmental problem but also generated attractive income for the company.

3. Project Performance and Impact

The present evaluation is based on assessment of the results and outputs of the project and a comparison of these with the verifiable indicators listed in the logical framework matrix of the project document, where applicable. The evaluation parameters include attainment of objectives and planned results; achievement of outputs and activities; implementation approach; stakeholder participation; financial planning and cost-effectiveness; country ownership; replicability; monitoring and evaluation; impact; and sustainability.

Attainment of Objectives and Planned Results

The objective of the GERIAP project "to develop and practically demonstrate a mechanism for encouraging company-level actions to increase the efficiency of energy use in their production processes, thereby reducing associated emissions, especially of greenhouse gases" has largely been achieved through the following: development of the *Energy efficiency guide for industry in Asia;* building capacity of national focal points and participating industrial plants to identify cleaner production and energy efficiency options; actual implementation of some of the identified options; and disseminating the results of the project in the region in general and to the participating countries in particular.

The primary focus of the developed or tested methodology was improvement in energy efficiency of industrial plants. The cleaner production and energy efficiency options identified and implemented in the industrial plants were also mostly for improving energy efficiency; greenhouse gas emission reduction has taken place as a consequence of reduction in energy consumption. The estimated greenhouse gas emission reduction at 38 plants for which the results could be measured was 1,082,284 tonnes of carbon dioxide per year. Emissions of certain other associated pollutants, for example, sulphur and nitrogen oxides and their reduction, and also reduction in materials and water consumption and in the generation of wastes, were covered only indirectly.

One of the objectives of the project was to produce four industry-specific guidance manuals on energy efficiency improvements, including case studies from the project for each of the targeted industry sectors. Instead of the guidance manuals, the project produced the *Energy efficiency guide for industry in Asia* in various forms: hard-copy publication, website and CD-ROM. The guide contains more information than could be expected from four guidance manuals: information on five industrial sectors (the ceramics sector was added); a general six-step approach to attaining energy efficiency applicable to all industry sectors; training materials; a contact database; equipment; and related information such as case studies, guidelines on financing energy efficiency and information about climate change, the Kyoto Protocol and the Clean Development Mechanism, together with an energy efficiency survey and policy review.

The project document envisaged that development of policy guidelines would take place through discussions involving participation of concerned government authorities. In reality, no direct involvement of or discussions with concerned government authorities took place under the project. Nevertheless, the project is likely to contribute to energy efficiency policy formulation in the region indirectly; some reasons for this optimism are given in the paragraphs below.

The GERIAP energy efficiency guide is a useful tool that is likely to be widely used. This and the results of the energy efficiency survey and the policy review document, which are available on the guide website and on CD-ROM, are likely to trigger national policy initiatives in the future.

The GERIAP secretariat has disseminated the important results of the project regionally to national and regional policymakers and other stakeholders who are on the contact list of the project. The UNEP Regional Office for Asia and the Pacific sent the guide to all ministries of environment in the Asia-Pacific region.

The national focal points are direct government entities in some countries, such as China, Indonesia and Mongolia. In some countries, the national focal points are indirectly related to the government; these include India, the Philippines and Thailand. In Sri Lanka, the national focal point is a small and medium-sized enterprise developer, established originally as a project of the Federation of Chamber of Commerce and Industry, while the national focal point in Viet Nam is a national cleaner production centre established at a university. Because of the close link with national governments through the national focal points, it is expected that GERIAP project outcomes will catch the attention of the concerned ministries and provide policy input in due course in all those countries.

The presence of senior government officials from concerned ministries, for example, the Ministry of Industry, the Ministry of Science and Technology and the Ministry of Environment, in the awareness and GERIAP guide launch seminars served to disseminate information about GERIAP and its outputs and facilitate possible use of the outputs in policy formulation. In some countries, ministers were also present at those seminars and the seminars thereby attracted significant media coverage.

The GERIAP project coordinator met senior people from concerned ministries during or after the GERIAP guide launch to make them aware of the project outcomes.

In Mongolia, the consultant who was involved in carrying out GERIAP project studies is now employed in the Ministry of Fuel and Energy as Head of the Renewable Energy Division. He is also responsible for energy efficiency and Clean Development Mechanism activities in that country. In view of his GERIAP project connection, it is likely that the project findings will serve as policy input in Mongolia in the future and may also result in follow-up activities.

The project has built capacity in the national focal points and industrial plants involved. As a result, they were able to participate effectively in teams for assessing cleaner production and energy efficiency options at industrial plants; the teams were normally led by external consultants. In total, 35 national

trainers participated in the two-week International Training of Trainers Workshop organized in March 2003. Although BPPT of Indonesia was not a GERIAP national focal point at the start of the project, 12 BPPT staff were trained by consultants from the National Productivity Council of India during the week of 5 to 9 December 2005. Thus, the target of training 40 professionals under the project, as indicated in the logical framework matrix, can be regarded as achieved.

In addition, capacity-building was also carried out in the participating countries by the national focal points through the technical training seminars which they organized in 2003. The total number of people trained through those seminars in the participating countries was 178. BPPT of Indonesia trained over 100 people in 2006. The project document set a target of 25 participants in each country and a total of 225 in the nine countries; this target can be regarded as met through the training programmes of 2003 and 2006.

The project document set a target of involving at least 100 professionals in national awareness seminars in each participating country. Annex V shows that the number of participants in the national awareness seminars in the project countries was 425; this is significantly below the target given in the project document of at least 100 professionals in each country, a total of at least 900in the nine countries. If participation in the guide launch seminars is also considered, the total number of participants exceeded the target of 900. There was obviously, however, significant overlap in participation in these seminars, with some people participating in both seminars, so adding the total number of participants in the two seminars would be misleading. Also, some of the participants did not benefit in terms of awareness-building since, for example, 19 of the 56 participants in the national guide launch seminar in Delhi were from the Indian national focal point itself. In general, the participants in the national awareness and guide launch seminars included professionals as well as others; for example, representatives from embassies or donor agencies, ministries and media. Thus, not all of the seminar participants were professionals. Overall, the project did not appear to have made any conscious effort to inform professionals who were not directly associated with it.

The project provided opportunities for the national focal points to learn from each other; these included a training of trainers workshop organized in 2003 for national focal point representatives, who took the lead in organizing national training seminars later; cross-learning visits (one per national focal point); a regional GERIAP workshop held in Kuala Lumpur in 2004 with three or four participants from each national focal point; and advisory board meetings in which the leader of each national focal point participated.

Cross-learning visits of the national focal point representatives were apparently successful. All countries except Thailand took advantage of the opportunity for such visits. The success of the visits could be better judged if reports on them were available; submission of reports, however, was not a requirement for the cross-visits, and no reports were submitted. Follow-up projects could make reports on mutual visits a requirement.

Experts from one national focal point, the National Cleaner Production Centre of India and the organization that hosts it, the National Productivity Council, visited most of the other participating countries as consultants and facilitated in-plant assessments; thus, they indirectly built the capacity of the concerned national focal points and cleaner production and energy efficiency plant teams. They also gained new experience in the process.

The newsletter, which was visualized as the "prime information dissemination channel" in the logical framework matrix of the project document, was not effective for information-sharing outside the immediate project partners. Since the newsletter was published in English only, language was a barrier to its usefulness in disseminating information to wider groups of stakeholders or even among the participating industrial plants in most countries. Also, the newsletters focused on mostly non-technical matters and were not of much interest to the participating plants interviewed.

One industry representative from each of the GERIAP project countries participated in the regional stakeholder workshop and the international guide launch. This gave the industry representatives from the nine countries an opportunity for limited interaction with each other.

Textbooks and reference books on energy conservation, energy management and energy audits started to appear on the market in the 1980s, for example, Smith (1981) and Turner (1982). Many publications in different forms (books, manuals, and so on) have appeared since then. The training materials of the GERIAP project and the *Energy efficiency guide for industry in Asia* are based on the synthesis and incorporation of available external scientific and technical information and knowledge on energy efficiency in industrial plants.

The strategy developed in the various industry sectors for identifying, promoting and supporting reduction in greenhouse gas emissions through energy efficiency is appropriate since reduction in energy use through efficiency improvements would automatically lead to greenhouse gas emission reduction too. Also, considering that reduction of energy use reduces the energy costs and improves the profitability of industrial plants, industries are likely to maintain the improvements in energy efficiency achieved and try to make further improvements. This was true in practically all the countries, particularly in view of the open trade principle under the World Trade Organization agreements. Thus, the strategy for reducing greenhouse gas emissions in industries could be regarded as successful and sustainable.

Achievement of Outputs and Activities

The expected results of the project included:

(a) An established and tested methodology for identifying and implementing greenhouse gas emission reduction measures at company level in selected industry sectors;

(b) Improved awareness and capacity in targeted industry sectors in the region on the need for production efficiency and practical options to improve it and reduce waste and emissions through the application of the cleaner production methodology;

(c) Improved understanding of policy options for promoting greenhouse gas emission reduction measures in industry;

(d) Reduced greenhouse gas emissions from targeted industry sectors.

The achievement of expected results for (a), (b) and (c) above was satisfactory. A simple yet comprehensive six-point methodology for identifying and implementing greenhouse gas emission reductions through improving energy efficiency was developed and demonstrated at 44 plants. (It should be noted that the logical framework matrix of the project document set a target of 45 demonstration plants.) Awareness of the need to improve energy efficiency has been improved at the participating industrial plants, and the basic capacity needed for that purpose has also been improved. Although capacity development under the project mostly remained confined to the participating industrial plants, awareness at other industrial plants which participated in national awareness and guide launch seminars has also improved.

As a part of the activity on external factor analysis (x9 of the project document), an energy efficiency survey was carried out to identify key barriers to energy efficiency improvements in industries; the main reasons for companies to implement energy efficiency measures; the importance of key stakeholders in implementing energy efficiency measures; and what is needed to assist industry in becoming more energy efficient. The survey, a regional stakeholder workshop held in January 2005 and a policy review on improving energy efficiency in industry in Asia have resulted in a better understanding of policy options for promoting greenhouse gas emission reduction measures in industry. (Further related discussion on this point can be found under the implementation approach evaluation parameter).

In comparison, the expected result (d) above, reduced greenhouse gas emissions in the targeted industrial sectors of the selected countries as a result of the project activities, was not as significant. The implementation of energy-efficiency options mostly remained limited to selected processes at the participating industrial plants and have not yet been replicated significantly. The original target of the project as set forth in the logical framework matrix was to reduce greenhouse gas emissions from the participating companies by at least 10 per cent before the end of the project. The estimated actual reduction was well below 10 per cent at most of the plants. However, the evaluator regards the original target of 10 per cent as unrealistic for a project to attain (especially at large plants where only a small part of the plant was available for assessment and implementation of cleaner production and energy efficiency options), and regards the actual reductions achieved at the participating plants within the time frame of the project as quite satisfactory.

The project outputs were generally of good quality. One of the main outputs of the project, the guide, with some of the materials translated into eight Asian languages, may find wide application in the future. In Thailand, there was substantial positive feedback in the media after the launch of the guide. In the Philippines, the Secretary of the Department of Science and Technology, Dr. Alabastro, indicated that the GERIAP outputs would help industries identify solutions to reduce costs; the Secretary of the Department of Energy, Raphael P. M. Lotilla, mentioned that the guide would be of great assistance to industries. Feedback obtained from a number of people visited by the evaluator suggests that they found the guide easy to use for accessing valuable information on energy efficiency in industries. Feedback from national focal points of other countries also suggests that the guide would be useful for their countries.

Studies on energy efficiency improvement in industrial establishments started soon after the energy crisis of 1973 and led to development of training materials and textbooks. The methodology developed under the project, which is mainly for improving the energy efficiency of industrial plants, is based on a sound synthesis of knowledge on energy management at industrial plants. (Further related discussion on this topic can be found under the attainment of objectives and planned results evaluation parameter.)

The project outputs include a cleaner production and energy efficiency methodology for industrial plants. This emphasizes planning and organization – assessment, identification, analysis, and implementation or monitoring of cleaner production and energy efficiency options – and also continuous improvement, and is based on a sound understanding of energy saving opportunities at industrial plants. Significant adoption of the methodology may occur because of its dissemination through the guide website. Further dissemination of the guide and capacity-building are likely to create a policy impact in the countries involved. Another project output that may influence policymakers is the policy guidance report hosted on the guide website.

Expertise in energy conservation requires sound knowledge of all major thermal systems for energy conversion, transfer and use, for example, boiler furnaces, heat exchangers, heating, ventilating and air-conditioning systems, cogeneration, and thermal insulation, together with related topics such as combustion, heat transfer, psychrometrics and thermodynamic cycles. It also requires knowledge of electrical systems such as motors, generators and lamps. An industrial energy manager also needs to be aware of cleaner production concepts and to know about organizing energy management programmes, and also the economics and financing of energy efficiency projects. Overall, the GERIAP training of trainers (2003) programme was useful. The trainers involved in training representatives from the national focal points in the project did well in preparing a 370-page guidance manual and conducting the two-week training using PowerPoint slides. It is not possible, however, to cover the whole cleaner production and energy efficiency subject matter in any depth in a two-week training programme. The training time could not provide adequate capacity-building of national focal points to enable them to carry out in-plant assessment of cleaner production and energy efficiency options independently or to provide proper coverage of all energy-conservation-related topics in a 370-page document.

Further capacity-building of some of the national focal points would be necessary for that purpose in the future.

Some of the national focal points commented that spending more time on use of monitoring instruments in the training of trainers would have been useful to give them more confidence in using those instruments when monitoring industrial plants. Although monitoring instruments were valuable to national focal points in carrying out the in-plant assessments, it was been pointed out that some of the instruments provided for the national focal points through the GERIAP project were not appropriate, for example, the temperature-measuring device demonstrated or provided was not suitable for the high temperatures encountered in some industries, for example, in the steel or ceramic industries. Also, the walk-through sessions of the training of trainers were conducted in large groups, making it difficult for some participants to hear the instructors. Sending the lecture notes which were prepared for the training together with the guidance manual to the participants in advance would have been helpful.

The diversity of backgrounds of the participants was a problem in the training of trainers since participants needed a technical background to understand some of the training materials and several participants did not have that background.

The training focused mostly on technical matters. It would be desirable, however, to introduce non-technical issues involved in the successful promotion of cleaner production and energy efficiency in industrial sectors, for example, how to organize a cleaner production and energy efficiency programme through eliciting management commitment, building general awareness and generally involving or motivating employees.

The national awareness seminars, technical training seminars and round tables were quite successful. The national focal points built up the cleaner production-energy efficiency capacity of plants and facilitated identification and implementation of these options. Additional training was given when needed. Dr. Gupta of the National Cleaner Production Centre, India, visited a fertilizer plant in Bangladesh and convinced the management that they could improve energy efficiency substantially; he also visited a ceramics plant in Bangladesh and ran an additional training course. Additional training was also organized in Indonesia, Mongolia, the Philippines, Sri Lanka and Thailand.

The industrial plants found capacity-building under the GERIAP project useful. However, the capacity-building in the plants has mostly served to make them aware of the possibilities of cleaner production and energy efficiency options and enabled them to identify relatively obvious and simple options. Considering that plant-level training lasted only five days and was mostly based on PowerPoint presentations (although external consultants were hired for additional training in some countries), building of technical capacity at the plants was not substantial.

Capacity-building of the national focal points and the participating plants and the availability of the *Energy efficiency guide for industry in Asia* in different forms – hard-copy publication, CD-ROM and website – are likely to facilitate further capacity-building in the countries involved and also in the region in the years to come. Early indications suggest that the guide will be of significant interest to various stakeholders in the region. Thus, the personnel of the national focal point in the Philippines received several queries about the guide after they announced that it would soon be available for distribution during an energy conference which they organized in October 2005. The GERIAP secretariat had received about 30 requests for the CD-ROM by the end of May 2006.

The guide has been disseminated to all those in the contact database of the project, including to the participants in the GERIAP barrier workshop. The website will serve to disseminate it further to more stakeholders in the future.

The GERIAP CD-ROM will be disseminated in China in cooperation with the United Nations Development Programme (UNDP)/Global Environment Facility project "End-use Energy Efficiency Programme" in China.

The CD-ROM can also be ordered by e-mail and can be freely copied. It is likely that the website and 5,000 copies of the CD-ROM will serve to disseminate GERIAP outputs to many of the major stakeholders in the future.

The GERIAP coordinator met Sohail Hasnie and Sujata Gupta from the Energy Section of the Asian Development Bank during her trip to Manila to attend the guide launch in the Philippines in March 2006. They expressed an interest in using the guide as an input for their planned project to establish an energy manager accreditation scheme (EMAS) for the Association of South-east Asian Nations (ASEAN) together with the ASEAN Centre for Energy (ACE). The GERIAP coordinator also collaborated with Spirax Sarco, a company that sells equipment for steam systems, in preparing the chapters of the guide on boilers and steam systems.

The GERIAP project used greenhouse gas indicator software developed by UNEP to assist in estimates and calculations of greenhouse gas emissions from companies. The GERIAP secretariat also developed a simplified version of the greenhouse gas indicator.

The project apparently did not have any link with a similar regional project on small- and medium-scale industries under the Asian Regional Research Programme in Energy, Environment and Climate project coordinated by the Asian Institute of Technology. A closer interaction between those projects, both of which were funded by Sida, would have been desirable. One reason for that lack of interaction was probably the slightly different time frames of the two projects: the last phase of the Asian Regional Research Programme in Energy, Environment and Climate project started in 2002 and was mostly over by 2004, whereas the GERIAP coordinator joined in May 2003 and project activities continued up to the end of June 2006.

Implementation Approach

A key strength of the implementation approach was the coordinated network of the national focal points. The network approach allowed the use of common training materials, consultants and methodology and also provided opportunities for the national focal points to share experiences. A weakness of the implementation approach was that it involved too many, albeit unavoidable, adjustments or revisions and there was a lack of seamless continuity in project implementation. Although the first instalment of the financial support from Sida was received at the UNEP Regional Office for Asia and the Pacific in January, the first project meeting took place only in July 2002. The July 2002 project meeting proposed several changes to the original logical framework matrix of the project document. The GERIAP coordinator, Sophie Punte, joined on 1 March 2002 by which time national awareness seminars in three of the nine participating countries were already over. Another source of confusion was that the project document was brief and unclear in some places. Thus the "results (c)" part of the logical framework matrix of the project document suggested that "improved understanding of policy options for promoting greenhouse gas emission reduction measures in industry" and development of "policy guidelines" could be achieved before the national awareness seminars were organized through participation of concerned government authorities. However, activities such as a review of policies or external factors (activity x9) and the policy workshop (activity 5a) which were needed in order to understand policy options properly appear later (in months 25–33) in the project workplan and timetable.

Project implementation involved:

(a) Preparatory work, which included identifying the national focal points, organizing the project start-up meeting to develop a plan for implementation and preparing training materials;

(b) Capacity-building of the national focal points through training of trainers and of the participating industrial plants through national-level training;

(c) Implementation of the main project activities for reducing greenhouse gas emissions through cleaner production and energy efficiency options in the countries involved;

(d) Preparation of an energy efficiency guide for industry and a review of policy measures;

(e) Dissemination.

This is similar to the approach implied in the project document. Some additional activities were also carried out using surplus funds that became available due to the favourable exchange rate of the Swedish krona with respect to the dollar during the project period. These additional activities, as detailed later in this section, enhanced the impact of the project.

The information dissemination and awareness-raising activities carried out under the project differed somewhat in detail compared with the project document. The project document indicated that additional awareness-raising seminars would be organized in the larger countries such as China, India, Indonesia and Viet Nam. Only one national awareness seminar was organized in each of the nine countries involved, however, so the project target of about 15 seminars was not attained. A policy guidance report based on an energy efficiency survey, a policy review on improving energy efficiency in industry in Asia and a regional stakeholder workshop was under preparation at the time of this evaluation and, based on these and other inputs, it is proposed that the guidance report will not be printed as suggested in the project document, but will be hosted on the guide website for wider dissemination.

Changing needs were routinely identified at advisory board meetings as well as within the GERIAP secretariat, and corrective measures were taken. These were included in the reports of the secretariat to Sida. One example of appropriate adaptation of the project to changing needs was the preparation of the guide, which gives more information than the four sector-specific guidance manuals originally envisaged in the project document; also, the CD-ROM and website are more appropriate tools, considering their growing importance as vehicles of information dissemination.

As a result of appreciation of the Swedish krona with respect to the dollar during the project period, it became clear that a significant amount of project funding would remain unused and become available for further activities. The secretariat made good use of the surplus by undertaking additional activities to consolidate the gains of the project. The additional activities carried out as a result of taking advantage of the favourable exchange rate and the extension of the project duration were:

(a) A GERIAP workshop of national focal points in Kuala Lumpur in March 2004 to evaluate the first year (in-plant assessment) and prepare for the second year (implementation of options and monitoring of results);

(b) Cross-visits of national focal points to participate in one another's in-plant assessments;

(c) Additional plant visits and training in Mongolia, Indonesia, the Philippines, Sri Lanka, Thailand and Bangladesh;

(d) Translation of the hard copy of the guide into Bangla, Mongolian, Tamil and Sinhala;

(e) Translation of the case studies into Sinhala;

(f) Translation of energy equipment chapters into Thai, Vietnamese, Chinese and Bahasa Indonesia;

(g) Decision-making and financing tools for the Clean Development Mechanism for Asian companies;

(h) Review of financial mechanisms available for cleaner production and energy efficiency projects in Asia;

(i) CD-ROM and website versions of the guide (the original agreement was to have only a hard-copy version).

The execution arrangement of the project was effective and involved GERIAP country teams which were responsible for execution of national-level activities, the GERIAP secretariat which served to coordinate or supervise the project activities and to arrange or provide guidance to country teams, and an advisory board to discuss problems encountered and identify corrective measures.

The GERIAP secretariat coordinated project activities and carried out a number of tasks for this purpose, including keeping track of the progress of the national focal point activities, troubleshooting, engaging consultants as and when needed, organizing meetings, and so on. The project advisory board meetings reviewed progress and suggested corrective measures to overcome problems faced in project execution. The overall project execution arrangement was satisfactory, although certain improvements would be useful for any follow-up projects. Thus, it would be desirable to have a technical advisor for the GERIAP coordinator. The present project had to depend heavily on external expertise of several consultants at various stages of the project. Having a technical advisor and a technical advisory committee in place of appointing consultants on an ad hoc basis would be worthwhile for quality control of technical outputs. The GERIAP project shared secretaries with other UNEP projects and sections. This created problems, particularly at peak times for project activities, and temporary administrative staff had to be contracted during these periods. A dedicated full-time administrative assistant under contribution by UNEP, as indicated in the original project document, would have been advisable for smooth project implementation.

Implementation of project activities at country level was supervised through regular progress reports submitted by the national focal points to the GERIAP secretariat. A format for reporting progress prepared by the secretariat for that purpose was useful in maintaining uniformity in reports from different national focal points and ensuring that progress regarding all relevant issues was covered. Use of financial support provided to national focal points by the project was included in the national focal points' progress reports.

At the national focal point level, routine daily work included project-related administrative and technical work, meeting plant management, communication with the GERIAP secretariat and the plants, and coordination of country-level GERIAP activities. The GERIAP team at the national focal points also had to look after certain routine non-GERIAP work at their organizations.

At plant level, the GERIAP project teams had to look after cleaner production and energy efficiency activities as well as certain routine non-GERIAP work at their plants.

The UNEP Division of Technology, Industry and Economics supervised the GERIAP project, while the UNEP Regional Office for Asia and the Pacific provided administrative and political support to the project. The GERIAP secretariat enjoyed a healthy relationship with those two divisions as well as with UNEP headquarters in Nairobi.

The project involved periodic submissions of progress reports by the country teams to the GERIAP secretariat in a prescribed format and reports by the secretariat to Sida and the UNEP Division of Technology, Industry and Economics. The GERIAP coordinator and the GERIAP project officer made several trips to the countries involved for routine visits, national awareness and dissemination seminars, in-plant assessments and so on. Some extra trips were undertaken to attend to other needs, for example, to China, Indonesia and Mongolia, where problems were encountered in selecting national focal points, and to India for discussions regarding the training materials, the cleaner production-energy efficiency methodology and preparation of the guide. These trips also provided an opportunity to keep track of the progress of country activities. The overall effectiveness of supervision and administrative and financial support provided by the GERIAP secretariat was satisfactory.

Some of the barriers encountered in facilitating country-level project activities included the lack of qualified staff, financial resources, energy and production data and monitoring instruments at the plants (a set of 12 basic monitoring instruments was provided to each national focal point through the GERIAP project). Coordination with some companies was less effective owing to the attitude of top management (who considered they were already following best practices and had the best engineers and technicians) and lack of effective communication between top management and junior-level staff. In some cases, the GERIAP plant team members were worried about losing face when good cleaner production and energy efficiency options were identified in their plants under the GERIAP project.

Small companies normally lack financial resources, systematic data and information systems, and monitoring instruments. This often made identification of energy efficiency options and monitoring of implemented options in such plants difficult. Large companies often lack effective internal (particularly, bottom-up) communication lines. In some cases, top management was not accessible and apparently did not believe that outsiders could make improvements in their plants.

In the Philippines, some of the activities were delayed because of delays in the release of funds from the Philippines treasury to the national focal point, although no problems were encountered in release of funds by UNEP to the Philippines. Some problems were also encountered in selecting industrial plants.

Any problems with national focal points tended to affect the progress of the entire GERIAP project in that country and sometimes for the overall project; this is to some extent inevitable in a regional project such as GERIAP which involves several countries and many industrial plants.

The UNEP Division of Technology, Industry and Economics supervised the project and advised the GERIAP coordinator on project-related issues as and when needed. The Division's regional industry officer participated in GERIAP advisory board meetings and gave input on important issues. The regional industry officer served as the acting GERIAP coordinator during the GERIAP coordinator's maternity leave. The UNEP Regional Office for Asia and the Pacific provided administrative, political and financial management support to the project. Neither of these UNEP divisions had any direct role in running routine project activities.

Although GERIAP represents a pioneering effort to promote cleaner production and energy efficiency and reduce carbon dioxide emissions in the industrial sector in selected Asian countries, its impact at the policy level has been limited. This appears to be partly attributable to a lack of serious concern about greenhouse gas emission reduction in developing countries, which meant that the project could not link up effectively with any related efforts. GERIAP was an on-the-ground project, and its primary focus was not policy analysis or development, so the lack of visible impact at the policy level is also partly attributable to the nature of the project. As indicated earlier in this section, development of policy guidelines through discussions involving participation of concerned government authorities did not occur as envisaged in the project document, so the lack of a visible impact of the GERIAP project at policy level is also partly attributable to the lack of direct involvement of or discussions with concerned government authorities.

Despite the lack of visible policy impact, the direct or indirect links of the national focal points with their respective governments, as pointed out earlier, may have supported development of energy efficiency and greenhouse gas mitigation policies in the partner countries or may do so in the future. Viet Nam issued an energy efficiency decree in September 2003 and there are sections in the decree that specifically address energy use in industrial plants and buildings. On 10 July 2005, President Yudhoyono issued Presidential Instruction No. 10/2005 on Energy Conservation as a short-term remedy. In Bangladesh, energy efficiency was included in the Draft National Energy Policy. It is likely that GERIAP has contributed indirectly towards these policy developments through its national dissemination events and through the efforts of the GERIAP secretariat and the national focal points

concerned. In Sri Lanka, a committee has recently drafted a document on national energy policy and strategies and the GERIAP national focal point concerned was invited to give feedback on the draft document on the topic of promoting energy efficiency and conservation.

The Viet Nam National Cleaner Production Centre was invited to comment on the UNDP industrial sector Clean Development Mechanism uptake project proposal; this was obviously a result of the Centre's involvement in energy efficiency improvement and reduction of greenhouse gas emissions from industrial plants through the GERIAP project.

Although GERIAP has not resulted in any direct policy initiative in any country so far, GERIAP outputs have strengthened the implementation of cleaner production and energy efficiency options in most countries.

At the plant level, the senior managers were generally made aware that energy efficiency policies should be included in the overall policy of the company, although the extent of management commitment differed between plants; in some large, energy-intensive plants – for example, Indocement of Indonesia – energy efficiency was already a parameter under scrutiny before the GERIAP project was launched. Further discussion regarding the selection of large industrial plants can be found under the stakeholder participation evaluation parameter.

The project has had no significant impact on industry sectors as a whole as its benefits and impacts have mostly remained confined to the participating plants. However, industry associations which were represented in some national dissemination seminars appear to be preparing follow-up or complementary activities. Thus, the Thai Federation of Industries approached the concerned national focal point, Thailand Institute of Scientific and Technological Research, to organize cleaner production and energy efficiency training programmes for its members.

Performance of the industrial plants in terms of management commitment and willingness to implement cleaner production and energy efficiency options varied from plant to plant. Lack of management commitment appears to be mostly attributable to lack of awareness regarding the benefits of implementing those options. In some cases, for example at a cement plant in Thailand, this was also partly attributable to a lack of confidence that the national focal point and its associates could improve equipment and operations supervised by the plant's well-qualified engineers: they did not realize that engineers are often unfamiliar with energy efficiency techniques since those areas are not yet covered in conventional engineering education. Three of the 47 plants initially identified stopped participating in the project later. Overall, the participating industrial plants made quite significant investments from their own resources to implement cleaner production and energy efficiency options; the total investment made by the industrial plants for implementing options identified through the GERIAP project was about $9.5 million. The investments in the various sectors were: iron and steel – $1,622,000; pulp and paper – $2,956,000; ceramics – $2,984,000; chemicals – $1,149,000; and cement – $871,000. Average investment per plant was: iron and steel – $202,757; pulp and paper – $422,330; ceramics – $746,063; chemicals – $114,922; cement – $79,189. The ranking of the industry sectors, in decreasing order of both total and per plant investments, is (i) ceramics; (ii) pulp and paper; (iii) iron and steel; (iv) chemicals; and (v) cement.

The project had mixed experiences regarding performance of national focal points. The selection of national focal points in Bangladesh, China, Indonesia and Mongolia was not satisfactory and the project had to put in extra effort and resources to complete the activities in those countries. A new national focal point had to be selected later in Indonesia to ensure satisfactory completion of the project activities. Several national focal points, however, participated effectively in the project and some are using the experience gained through the project and the materials included in the guide for other projects and with other companies or industries, for example Thailand (textile industry), India (through

its energy audit work of industrial plants) and Viet Nam (through the cleaner production assessments under other projects). The national focal point in Sri Lanka has initiated a cleaner production-energy efficiency project in the rice milling and the non-ferrous metals sectors.

Lessons from another regional project funded by Sida, the Network for Industrial Environmental Management, were taken into consideration in preparing the project proposal, particularly in formulating capacity development activities, in involving key stakeholders and in information dissemination.

The GERIAP project attempted to establish linkages with several other initiatives. Thus, the international launch of the GERIAP guide was carried out back to back with the Regional Commission on Sustainable Development conference organized by the Economic and Social Commission for Asia and the Pacific so that GERIAP outputs could be disseminated to the conference participants and the participants of the guide launch could participate in the regional conference. Also, the Bureau of Energy Efficiency of India will include the GERIAP guide in its training materials and host selected materials from the guide on its website.

The GERIAP project has maintained regular contact with the Asia Pacific Round Table for Sustainable Consumption and Production (APRSCP) and participated in conferences organized by it. It has also worked in close cooperation with some other organizations, including the Japan International Centre for Environmental Technology Transfer, in organizing three regional meetings (Philippines 2003 and 2004, and Viet Nam 2005) to train about 250 professionals from industry and government on cleaner production and energy efficiency issues and the GERIAP approach.

The GERIAP staff was active in supporting regional capacity-building on sustainable consumption and production, and presented the first regional sustainable consumption and production report at the high-level "Global Round Table on Sustainable Consumption and Production" in Mexico in late 2004.

The GERIAP secretariat effectively coordinated project activities and facilitated collaboration between the various national focal points. It initiated corrective actions as and when any problem arose at any national focal point or industrial plant.

Some of the national focal point to national focal point partnerships were very good, for example, between Bangladesh and India, and between Sri Lanka and India. The national focal points which are also National Cleaner Production Centres have regular links among themselves under the UNEP National Cleaner Production Network (Viet Nam and India). Collaboration between national focal points was, however, constrained by their tight schedules and was probably affected by the changes made in some of the national focal points, for example, in China, Indonesia and Mongolia.

Language ability created a problem in some national focal points. (Establishing an intranet for the participating national focal points to exchange views and learn from each other would be an idea to consider for a possible follow-up project.)

The coordination of country-level project activities by the national focal points was effective in the case of most small- and medium-scale enterprises. They were normally responsive to suggestions and communications as they saw the GERIAP project as an opportunity to build in-house cleaner production and energy efficiency capacity, and to reduce production costs through energy saving and waste treatment cost reduction, thereby improving competitiveness and compliance with environmental regulations.

Collaboration between national focal points and large companies was also satisfactory in some cases, for example, with the cement plants in Indonesia. As pointed out in some advisory board meetings of the GERIAP project, however, serious commitment from management was lacking at some of the big plants. Some of those plants considered involvement in the GERIAP project important to improve image but did not believe that the project would deliver any benefit.

In spite of problems and constraints, overall collaboration between national focal points and plants was effective; the national focal points served as the link between the project and the plants and often served as the technical arm of the industrial plants in identifying and implementing cleaner production and energy efficiency options.

The UNEP Division of Technology, Industry and Economics supervised the project, while the UNEP Regional Office for Asia and the Pacific provided administrative, political, and financial management support. The project did not receive guidance from national governments. The methodology of the guide developed by the GERIAP project was drawn from the in-plant assessment experience and the cleaner production and energy efficiency manual of the UNEP Division of Technology, Industry and Economics.

The GERIAP secretariat was effective in facilitating and coordinating project activities. It facilitated cross-learning visits for the national focal points and their trips to attend regional events, for example, the training of trainers workshops, advisory board meetings, regional workshops and organized events such as the regional launch of the guide. It organized additional training programmes for the national focal points, as needed, by identifying and appointing consultants, and planned or implemented additional activities to use the surplus budget. The effectiveness of overall coordination of the GERIAP project, which was a highly complex project, was commendable by any standards.

Stakeholder Participation

The major stakeholders in the project were national focal points, industry sectors and civil society organizations.

The national focal points were selected by the GERIAP secretariat; several candidate organizations were identified and interviewed initially to select the most suitable to become national focal points for the project. Impressions from the interviews, the track records from other projects and familiarity with the GERIAP subject matter were considered for this purpose. This is a sound process for selecting dependable national partners for the project. The final selection process, however, did not yield the most suitable national focal points in a number of countries, particularly Bangladesh, China, Indonesia and Mongolia. Experience in China, Indonesia and Mongolia suggests that involving ministries and important or large government organizations, although attractive in theory, may not be advisable: they may have too broad a mandate instead of the specific cleaner production and energy efficiency focus required, and they may not have direct industry links or experience. As a result, they end up having to rely on external organizations to carry out part of the work, making it more difficult to build in-house capacity. Also they may, as in the case of China, involve detailed bureaucratic procedures that slow down processes such as obtaining permission to participate in international meetings. Furthermore, the number of people involved in a narrow subject area in such organizations may be limited, so that the success of the project ends up depending on the efficiency and continued availability of one or two people. The often rapid turnover of employees in such organizations can further aggravate the problem. GERIAP faced such problems with national focal points in Mongolia and Indonesia. Experience in Bangladesh suggests that particular care needs to be taken in selecting institutes that may subsequently subcontract the work to commercial consultancies, unless they have a proven track record from similar projects.

The participating industrial plants were selected by national focal points from among the participants in the national awareness seminars and after indications that the plants would cooperate. Thus, in Viet Nam, about 30 companies participated in the awareness seminar out of which about 10 were selected for visits by the Viet Nam National Cleaner Production Centre, and five were finally selected for the project. This is a sound approach for identifying participating industrial plants.

Selection of plants in the GERIAP project, however, in some instances resulted in plants being chosen that were not the most suitable demonstration plants. In some cases the interest from the industrial plants did not come from top management; this resulted in difficulty in implementing options at some of these plants. Some of the big plants which participated enthusiastically in the project, for example, the three Holcim cement plants, were not the best target industrial plants. Being part of a multinational company, they had ongoing energy efficiency programmes and could have mobilized resources to employ external consultants to identify further options instead of joining the project.

Selection of these companies for the project appears to be the result of a dilemma. The project asked the national focal points to select large plants within the specified sectors; this made it difficult for them not to select multinationals (for example, in Sri Lanka there is only one cement plant, which is a Holcim plant). Industrial plants which have little cleaner production and energy efficiency awareness but are eager to become aware and implement options to improve their competitiveness would be more deserving industrial partners for a sequel to the GERIAP project; large plants should be excluded or asked to contribute financially to the project if they want to participate.

The project document suggested that the industrial plants in the most energy-intensive sectors should be selected for implementing cleaner production and energy efficiency options. In most cases, selected plants were energy intensive; however, some of the participating plants, such as Medigloves Limited of Thailand, although part of the chemicals sector, were not so energy intensive. Many national focal points indicated that small- and medium-scale enterprises were generally more cooperative in implementing the project activities; they were also generally more eager to have access to outside expertise to improve their profitability. The criteria for selecting partner industrial plants (large, energy-intensive plants or small- and medium-scale enterprises) may need careful consideration in a follow-up phase.

An energy efficiency survey was carried out to identify key barriers to energy efficiency improvements in industries, the main reasons for companies to implement energy efficiency measures, the importance of key stakeholder groups in implementing energy efficiency measures and what is needed to assist industry in becoming more energy efficient. The national focal points identified 186 companies and other stakeholders from eight of the GERIAP countries to participate in this important survey. The survey questionnaires from Mongolia were delivered after the closing date and therefore could not be included in the survey report which was used as the main input for discussions at a regional stakeholder workshop held from 24 to 26 January 2005 in Bangkok. Over 40 key stakeholders, including representatives of the national focal points, business, academia, governments and international organizations, participated in that workshop, whose purpose was to develop practical recommendations on how to overcome barriers to energy efficiency in industry. Mongolia was not represented at the workshop since the main person at the national focal point had left to join UNDP and the national focal point coordinator had moved to a different position.

Participation of the national focal points in some countries was not satisfactory. Some problems encountered with the national focal points in Indonesia and Mongolia were resolved as far as possible through the efforts of the GERIAP secretariat. In Mongolia a local consultant was contracted directly and in Indonesia a second national focal point was engaged, in agreement with the original national focal point, to ensure that the project could be completed successfully. As a result of inordinate delays in Mongolia, however, the case study materials could not be translated into Chinese, Thai, Vietnamese, Bahasa Indonesia and Sinhala.

Some of the participating plants did not cooperate fully. One plant each in Indonesia, Bangladesh and Viet Nam stopped participating in the project. As a result, energy audits were carried out in 47 plants but case studies were developed for only 44 plants compared with the 45 plants targeted in the logical framework matrix. Also, proper implementation of cleaner production and energy efficiency options in

some plants was difficult because of a lack of commitment on the part of top management, financial constraints or for other reasons.

Dissemination of the project findings was satisfactory in most countries. Several non-participating industrial plants participated in the guide launch in some countries, for example, in Indonesia, Sri Lanka and Viet Nam, so the possibility of replication of the project in those countries is high. Dissemination of the project's findings to industrial plants which did not participate directly in the project, however, was not satisfactory in some countries. Thus, the presence of non-participating industrial establishments at the national guide launch seminars in India, Thailand and China was insignificant; the GERIAP project could have created more impact by disseminating the guide and case studies more widely to other industrial plants or establishments in those countries.

The fact that only three out of the 47 selected plants stopped participating in the project later shows that overall participation of the selected plants was good. The participating plants, however, can be regarded only as small parts of the industry sectors concerned. Considering the unsatisfactory level of participation of industrial plants not directly involved in the project, through the national events, implies an unsatisfactory level of participation of the industry sectors, which are the actual industry stakeholders of the project. Effectively involving the non-project plants in national events such as the guide launch would have motivated them to catch up with the participating plants in their sectors in cost-cutting by implementing cleaner production and energy efficiency options. It may be noted that the project could remove any barriers to cost-effective cleaner production and energy efficiency options in most of the participating plants; by involving the non-participating plants, barriers could also have been removed to some extent in entire industry sectors.

Civil society organizations were involved only indirectly, mostly through media coverage of GERIAP events such as the national awareness seminars and guide launch.

As explained in more detail in the attainment of objectives and planned results section, the project did not appear to have made any conscious effort to inform professionals who were not directly associated with it, although the project document set a target of informing at least 900 professionals through national awareness seminars or other meetings.

The project document appears to have envisaged closer involvement of and guidance from concerned government authorities, but involvement of government authorities in the project was superficial and was in effect limited to their representatives attending some seminars.

A total of 40 selected stakeholders participated at the regional stakeholder workshop held in Bangkok in January 2005; the participants included representatives from the national focal points, business, academia, governments and international organizations. Almost 200 representatives from industry, government, the finance sector and other stakeholders in industry from around Asia attended the international launch of the guide in Bangkok in January 2006.

Feedback from the national focal points was considered at advisory board meetings and adjustments in project activities were made if necessary. Feedback from all stakeholders in the barrier survey and barrier workshop formed the basis for identification and ranking of barriers to cleaner production and energy efficiency options. This provided the information required to formulate measures to remove those barriers and to decide on the best way to spend the additional funds available as a result of the favourable exchange rate.

The GERIAP project by its very nature did not involve many gender-related issues. In general the units involved in the project, national focal points and the secretariat had a reasonable distribution of male and female staff members, except in India and Bangladesh, where those involved were all male. The male to female ratio of the national focal point team members in the various countries were:

Bangladesh – 4:0; China – 2:1; India – 2:0; Indonesia – 6:4; Philippines – 6:2; Sri Lanka – 3:1; Thailand – 6:3; and Viet Nam – 4:1.

Financial Planning

Project expenditure was based on a detailed budget prepared and later revised and approved by the UNEP Nairobi office, as and when needed, to meet evolving project requirements. Annex VI presents a summary of the project budget as of April 2006 showing total amounts spent in 2002, 2003, 2004 and 2005 together with sub-allotments for the year 2006; it also shows details of the sub-allotments.

The project fund was managed by United Nations Office at Nairobi (UNON), which issued a sub-allotment each year to the Economic and Social Commission for Asia and the Pacific finance department, and GERIAP spending had to be kept below that amount for that year. Allocation of funds for the different line items of the project budget and availability of remaining funds to spend could be checked online through the integrated management information system (known as IMIS) maintained locally by the Economic and Social Commission for Asia and the Pacific. The project management had access to the system and could thus usually make informed decisions regarding the budget at any time. As the official budget was kept in Nairobi, expenses incurred by the UNEP Division of Technology, Industry and Economics, Paris, went directly to Nairobi. As a result, the exact fund balance at any time was difficult to ascertain, putting a further constraint on the GERIAP coordinator in managing the budget effectively. Revisions to the sub-allotment had to be requested several times during the project because of changing project needs and time frames; often, the allocation of money had to wait until revised sub-allotments were approved by UNON.

Certain developments, such as amendments to the original logical framework of the matrix following the first project meeting, the surplus budget generated by the favourable exchange rate of the Swedish krona with respect to the dollar, the reduced payment to Mongolia and the extension of the project up to June 2006, necessitated budget revisions on at least six occasions. Two of the sub-allotment revisions in 2002 were attributable to some confusion in communication with the local United Nations administration at the Economic and Social Commission for Asia and the Pacific in Bangkok.

The use of funds by the project secretariat and partner organizations was efficient and diligently monitored using standard practices followed in the respective organizations. Each of the national focal points had to submit an expenditure statement certified by an authorized national focal point official as a part of its progress report each year.

Use of funds at the Economic and Social Commission for Asia and the Pacific, which managed the project fund locally, is routinely audited by external auditors every one or two years.

Participating countries provided in-kind contributions of approximately $500,000 in total (in the form of salary for participating staff, use of office facilities, domestic travel and so on).

In addition, UNEP covered all expenses related to administrative support, the secretariat office, associated facilities and project start-up activities, including recruitment of the project coordinator. In the project document, that support was estimated as $345,000. Considering that a full-time administrative assistant for the project was not available, the actual UNEP contribution was somewhat less.

The participating industrial plants made the investments necessary to implement the cleaner production and energy efficiency options identified through GERIAP which they considered attractive. One of the plants invested $24,000,000. It is likely that that investment was mostly accounted for by the other ongoing energy efficiency activities of the plant; that plant was therefore excluded from the greenhouse gas mitigation results mentioned above. Excluding the investment in that plant, the total investment made by the remaining 38 plants which participated in the project amounted to $9,582,920.

This amount could be regarded as additional funding leveraged by the project and is very substantial compared with the donor funding for the entire project.

Interest in building national cleaner production-energy efficiency capacity and maintaining good relations with the United Nations agencies appear to be the main factors for the countries involved which motivated them to contribute in kind. The in-kind contribution of the participating national focal points was attributable to their interest in cleaner production and energy efficiency capacity-building and to professional recognition of the institute and people concerned.

Investments made by the industrial plants were intended to enhance their profitability by reducing energy costs and to improve their image through their environmental protection efforts and their association with a regional effort.

Cost-effectiveness

The project outputs met or exceeded the expected outputs of most national focal points. The national focal points gained significantly from their capacity development and established contacts with industrial plants and industry associations through the project. The project has prepared most national focal points for a bigger role in their respective countries in the area of cleaner production and energy efficiency and they are getting involved in follow-up activities funded by other sources. Thus, the Federation of Thai Industries has approached the Thai national focal point, the Thailand Institute of Scientific and Technological Research, to organize training programmes for its members. The Viet Nam National Cleaner Production Centre has initiated a United Nations Industrial Development Organization (UNIDO) project to build their capacity on the Clean Development Mechanism. BPPT is now training Indonesian companies using the guide's training materials. The Sri Lanka national focal point has launched a GERIAP-type follow-up project.

The project has also resulted in significant monetary benefits to the participating companies through the implementation of cleaner production and energy efficiency options.

As has been mentioned, the overall outputs of the project secretariat were more than originally planned. These activities can be regarded as a commendable use of the effects of a favourable exchange rate.

The overall impact of the project in the participating countries and the region was high considering the amount of donor funding involved. Also, the staffing of the secretariat was limited so that the administrative costs involved in running the project stayed relatively low.

The total funding received by the project was $1,950,991. This resulted in a greenhouse gas emission reduction of 1,082,284 tonnes of carbon dioxide per year (295,168 tonnes of carbon) at 37 plants for which the results could be measured. The industrial plants under the project made investments of about $9.5 million in cleaner production and energy efficiency options in order to improve their profitability and save about $27 million annually, corresponding to a collective payback period of only about four months. In the absence of the project the industrial plants would probably have made similar investments to improve their profitability in alternative ways that would not have produced global environmental benefits; taking this as the baseline, the project fund of $1,950,991 has changed the course of events, leading to greenhouse gas mitigation through its implementation. This implies that project funding of $6.6 has resulted in a 1 tonne carbon emission reduction per year. Considering that the project has resulted in other significant benefits as well (for example, capacity-building, environmental projection and production of the guide), and that the achieved greenhouse gas emission reduction will take place for several years, emission mitigation under the project has occurred at a substantially lower cost compared with a short-term threshold for greenhouse gas mitigation cost of $10 per tonne (see http://www.gefweb.org/COUNCIL/GEF_C13/ doc/C13_14.doc). Thus, based on this

broad-based reasoning, the project could be regarded as highly cost effective considering the greenhouse gas mitigation aspect alone.

Country Ownership

GERIAP fits in with the focus on enhancing energy security and environmental conservation for sustainable development of practically all countries, so it is not surprising that representatives from different ministries were present at the national awareness and guide launch seminars in most countries. Relevance of the project for national development agendas is clear from the fact that some GERIAP countries have already explicitly formulated energy efficiency interventions, for example, Thailand's Energy Conservation Promotion Act (1992); the Energy Conservation Law of China (1997); India's Energy Conservation Act (2001); the Viet Nam Energy Efficiency Decree (2003); and Indonesia's Presidential Instruction No. 10/2005 on Energy Conservation.

Asian countries have been paying increasing attention to the efficient use of energy and resources and environmental protection. Thus, as noted by the Chinese national focal point, "In China's eleventh five-year plan, it is clearly stipulated that one of the important objectives to be achieved during the eleventh five-year period is to 'significantly improve energy efficiency, and to reduce energy consumption, per unit of gross domestic product, by 20 per cent compared with that at the end of tenth five-year period'".

All the GERIAP countries have ratified the Kyoto Protocol and thus subscribe to the principle of "common but differentiated responsibility" of all countries regarding mitigation of greenhouse gas emissions.

In view of the above, the project, which aims to reduce greenhouse gas emissions from industrial plants by implementing cleaner production and energy efficiency options, very much fits into the national environmental agendas of all GERIAP countries.

The extent of commitment of the industrial plants to carry forward the process of identification and implementation of cleaner production and energy efficiency measures varies from plant to plant. Some plants are keen to carry on the process and have identified and implemented several options by themselves after the GERIAP plant assessments were over.

It is likely that the companies will implement more options in the future if their feasibility is established, since such energy-saving options also imply cost reduction.

Replicability

The project should be replicable at other industrial plants similar to those participating if the guide and case studies of the GERIAP plants are disseminated to them, particularly if their capacity is built up to a certain level. Since the processes at those plants are similar to those at the GERIAP plants, it should be possible to achieve similar cost and energy savings by implementing similar cleaner production and energy efficiency options. The project is also likely to be replicable in companies from other industry sectors, since many of the options and materials developed concern energy equipment (boilers, furnaces and motors, for example) that are used widely by most industrial plants. The national focal point in Sri Lanka has already initiated a similar project in the rice milling and the non-ferrous metals sectors. The project should be replicable in other countries in the region as well. Since most of the training materials and a significant number of case studies are now available, it should also be possible to replicate the project at a relatively low level of funding in other geographical regions, for example, in Latin America, Africa and Eastern Europe, although translation and regional adaptation of materials would be required in some cases.

Replicability of the project may be constrained by lack of awareness of the monetary and other benefits of cleaner production and energy efficiency options, and also because of the secretiveness of some industrial establishments about their industrial processes, energy consumption, production data and so on. It would be necessary to educate the top management of industrial plants and industry associations for large-scale replication of the project.

Replicability will be further enhanced because the guide was fully or partially translated into nine Asian languages.

Monitoring and Evaluation

The monitoring of project progress was effective and involved: GERIAP country teams which were responsible for the execution of national level activities; the GERIAP secretariat, which served to coordinate or supervise project activities and to arrange or provide guidance to country teams; and advisory committee meetings to discuss problems encountered and identify corrective measures.

The project involved regular submission of progress reports by the country teams to the GERIAP secretariat in a standard format devised by the GERIAP project secretariat for that purpose. Those progress reports were used to monitor and evaluate country activities. Trips by the GERIAP coordinator and GERIAP project officer to the countries involved on various occasions also provided an opportunity for further monitoring and evaluation. Biannual reports by the secretariat to Sida and the UNEP Division of Technology, Industry and Economics facilitated monitoring of project progress by Sida and the UNEP Division of Technology, Industry and Economics.

The national focal points monitored the progress of the activities in the participating industrial plants through regular contact and communication. Only a few difficulties were encountered in the process; for example, one ceramic plant had to move out of Hanoi during project implementation, making it impossible to monitor progress.

Monitoring greenhouse gas emissions in many industrial plants was difficult because of a lack of data, since changes in greenhouse gas emission could take place as the result of several factors, including changes in production levels.

In general, monitoring of the cleaner production and energy efficiency options implemented at the industrial plants was limited by the shortage of time for national focal points to monitor the plants after implementation and the absence of data or information systems at many of the plants. Much monitoring was carried out by the plant teams and the data were analysed by the national focal point for evaluation and reporting.

Impact

The major impacts of the project were the guide in its various forms (hard-copy publication, CD-ROM and website); raised awareness of the various stakeholders; capacity-building of national focal points and participating industrial plants; company-level gains related to cleaner production and energy efficiency and cost cutting; identification of barriers to cleaner production and energy efficiency options at industrial plants; and investments made by the industrial plants and the associated changes.

Reduction of dependence on imported fuels and reductions in carbon dioxide emissions, electricity demand, air pollution and wastewater production, together with enhanced energy security, are other impacts of the project.

The impacts are significant, considering the need to save energy in the face of escalating energy costs and the need for greenhouse gas emission reductions to address the problem of global climate change.

The project could have had significantly more impact, however, by involving non-participating industrial plants more closely and through more effective awareness-building.

Sustainability

Capacity and awareness developed through the GERIAP project and secondary capacity-building through further training programmes organized by national focal points, together with the positive impacts of the options implemented, will benefit the GERIAP countries and the region even after the project ends. The guide will be beneficial for future cleaner production and energy efficiency and greenhouse gas mitigation initiatives. As the guide is available on the internet, access to information contained in the guide is easy compared to conventional publications.

The project encouraged some industrial plants to identify further cleaner production and energy efficiency options on their own; thus, Pindo Deli Pulp and Paper of Indonesia plans to carry on energy efficiency activities to reduce its monthly energy cost from $5.5 million to $4 million, and Medigloves Limited of Thailand has introduced a scheme of recognizing employees who can identify any viable cleaner production and energy efficiency options. Some industrial plants, however, were not open to new ideas or suggestions from outsiders, including those from the national focal points concerned and their consultants. The plant project team or national focal points concerned found it difficult to meet with the top managers of some plants, and three of the 47 plants decided to discontinue participation in the project.

Although some of the participating industrial plants are keen to carry on the process and have identified and implemented several options by themselves since the GERIAP plant assessments were over, the extent of commitment of the industry sectors to carrying forward the initiatives varies from country to country. This appears to be partly attributable to the difference in the extent of dissemination of the project outputs among industry sectors in the different countries. Thus, in Viet Nam, where industry associations and several industrial plants were present at the guide launch, there appears to be significant interest and commitment on the part of the industry sectors in carrying forward the initiatives of the project. This does not seem to be the case in countries where participation of non-GERIAP industrial plants was negligible, for example, in Thailand.

It may be noted that the project in each country was carried out by the national focal points and the few participating companies. The project did not involve a commitment from industry sectors collectively, and it is unrealistic to expect that the four or five participating companies in each country can carry forward the initiative for their entire sector. It is also important to note that in many Asian countries, industry associations play the role of lobby groups for industry in negotiations with government, but their role as educators and influencers of industry is underdeveloped. The capacity-building and potential role of industry associations could also be a focus in future projects.

4. Conclusions and Rating of Project Implementation Success

Conclusions

The GERIAP project was successfully implemented in the nine participating countries. Overall, the project created practical outputs that exceeded normal expectations. Development of the Guide for energy efficiency in industries in Asia and of the capacity of national focal points in the participating

countries and of participating industrial plants, together with dissemination of the project results, will contribute positively towards energy efficiency improvement and greenhouse gas emission reduction in the participating countries.

The network approach of the project was found to be cost effective since it allowed the use of the same training material and a common methodology in all countries. The project would be replicable in other countries of the Asia-Pacific region as well as in other geographical regions.

Considering the growing importance of cleaner production, energy efficiency and greenhouse gas mitigation, a sequel to the project would be highly desirable.

Rating of Project Implementation Success

Category	Rating*	Comment
Attainment of objectives and planned results	2	The objective was largely achieved through development of the guide and capacity-building of the national focal points and industrial plants; implementation of CP-EE options; dissemination of the project results and findings; and sharing of knowledge across national boundaries. Although no direct involvement of or discussions with concerned government authorities took place under the project, the project is likely to contribute or to have contributed to EE policy formulation in the region indirectly as a result of dissemination of the guide and project findings through national dissemination and other modes (web-hosting and mailing of the guide) and direct or indirect links of the national focal points with concerned national government authorities.
Achievement of outputs and activities	2	Considering the time and resource constraints, capacity-building of the national focal points and the industrial plants was satisfactory. Availability of the guide is likely to facilitate further capacity-building after the project period. The project has benefited from outputs (CP-EE manual of UNEP-DTIE) and experiences (NIEM) of earlier projects and its outputs will be used in other projects in the region (ADB-ASEAN and UNDP-China)
Implementation approach	3	A key strength of the implementation approach was the coordinated network of its national focal points. Although national-level discussions with concerned government authorities and industry representatives to develop policy guidelines did not take place as outlined in the project document, the overall implementation approach was as planned in the project document. The level of dissemination through awareness seminars was below the original target. The project adapted well to changes during implementation and undertook additional activities to make fruitful use of surplus funds resulting from favourable exchange rates. The GERIAP secretariat was effective in facilitating and coordinating project activities.
Stakeholder participation	4	Stakeholder participation in the project was moderately unsatisfactory. The original selection of four of the nine national focal points was not satisfactory. Some of the industrial plants selected were parts of multinational companies, whose inclusion cannot be fully justified. The low number of participants in the awareness seminars, particularly in big countries such as China and India, implies that some potential stakeholders could not participate. The lack of presence of non-participating industrial plants in the national guide launch seminars in China, India and Thailand impaired dissemination of the project findings among those key stakeholders and diminished the likelihood of their benefiting from the outputs of the project. Lack of a coherent approach to interesting and involving stakeholders also compounded the problem. Thus, the programmes of the national guide launch seminars were quite different in different countries. In some cases, for example, Thailand, the seminar did not showcase the major on-the-ground achievements of the project (the case studies); many of the seminar participants in India were people from the national focal point itself and other government offices, who would not benefit from it significantly.
Financial planning	2	Project expenditures were based on approved allocations and project funds were managed with diligence. As a result of developments over which the project secretariat apparently did not have any control, the budget had to be revised about six times during the project. The project coordinator sometimes found it difficult to ascertain the exact fund balance. Timely planning of additional activities to use surplus funds that became available enhanced the impact of the project and is commendable.

Category	Rating*	Comment
Cost-effectiveness	2	Overall outputs of the project in terms of capacity-building, energy saving, greenhouse gas emission reduction and level of leveraged funding exceeded normal expectations for the level of project funding.
Country ownership	2	The project fits in with the priorities of the participating countries regarding enhancing energy security and reducing dependence on imported energy, and also with their acknowledged responsibility to reduce emissions of greenhouse gases.
Replicability	1	The project should be replicable at other similar industrial plants and also at plants from other industry sectors in the Asia-Pacific and other geographical regions.
Monitoring and evaluation	2	The monitoring of project progress was effective and involved (i) GERIAP country teams, (ii) the GERIAP secretariat, and (iii) advisory committee meetings. The project involved the periodic submission of progress reports by the country teams to the GERIAP secretariat in a standard format devised by the GERIAP project secretariat for that purpose.
Impact	3	The project has already had some impact; more impact is likely through dissemination of the guide in the future. However, impact would have been greater with more effective stakeholder participation.
Sustainability	2	Considering capacity developed by the project and likely to be further developed as a consequence of the project, and the practical benefits that it has brought about for the participating plants, the project outcomes are likely to be sustained and enhanced over time. Some national focal points and participating industrial plants have already initiated follow-up activities.

*Rating:

1 = highly satisfactory; 2 = satisfactory; 3 = moderately satisfactory; 4 = moderately unsatisfactory;

5 = unsatisfactory; 6 = highly unsatisfactory.

5. Lessons Learned

Lesson 1: The Selection of National Focal Points Needs Special Care

National focal points play a key role in achieving the objectives of regional projects such as GERIAP. The extent to which they can convince industry sector plants of the importance of cleaner production and energy efficiency options and motivate them to participate in the project depends on the industrial network that the national focal point possesses as well as its stature as perceived by the industries, and should be considered in selecting national focal points in future projects. Similarly, success in getting other key stakeholders, including policy personnel and members of civil society, involved and interested largely depends on the profile of the national focal point. Therefore, regional projects need to take special care in selecting national focal points.

Experience in China, Indonesia and Mongolia suggests that involving ministries and important or large government organizations, although attractive in theory, may not be advisable. These may have too broad a mandate rather than the specific cleaner production and energy efficiency focus required, and may not have direct industry links or experience. As a result, they have to rely on external organizations to carry out part of the work, making it more difficult to build in-house capacity. Also, they may, as in the case of China in the GERIAP project, involve detailed bureaucratic procedures that may slow down processes. Furthermore, the number of people in a narrow subject area in such organizations is likely to be small, resulting in the success of the project depending on the efficiency and continued availability of one or two people. The rapid turnover of employees in such organizations can further aggravate the problem.

GERIAP faced such problems with national focal points in Mongolia and Indonesia. Experience in Bangladesh suggests that particular care needs to be taken not to select as national focal points institutes that will subsequently contract the work to commercial consultancies, unless they have proven track records from other similar projects. Organizations which are adequately staffed with qualified people, have cleaner production and energy efficiency as a core area of focus, have an adequate network with industries and are well recognized nationally or affiliated with the line ministries, are best suited as national focal points.

Lesson 2: Cleaner Production expertise alone is not enough for National Focal Points to Serve the Growing Needs of the Industry Sectors

"The UNIDO/UNEP National Cleaner Production Centre programme was established in 1994 to build local capacity to implement cleaner production in developing countries and economies in transition." The need for national focal points to have expertise in both cleaner production and energy efficiency was emphasized by the GERIAP advisory board members from the Philippines, Sri Lanka and Viet Nam.

Considering the growing importance of reducing global greenhouse gas emissions and that greenhouse gas mitigation efforts in developing countries are likely to be carried out significantly under the umbrella of the Kyoto Protocol, a sequel to the GERIAP project could attempt to develop the capacity of national focal points on greenhouse gas mitigation through energy efficiency options under the Clean Development Mechanism. Alternatively, it could select national focal points which already have such capacity or have access to expertise on the Clean Development Mechanism methodologies of partner institutes.

Lesson 3: Industries are often not aware of the Advantages and Importance of Cleaner Production and Energy Efficiency Options

Many industrial plant managers often regard activities to identify and implement cleaner production and energy efficiency measures as a waste of resources and effort and as an interference in routine plant activities. That is why three of the 47 plants originally involved with GERIAP later stopped participating. Similar opinions were expressed by a number of advisory board members at its January 2005 meeting.

Lesson 4: It is Important to have Ministers or Senior Representatives from the Ministries Present at National-level Events

The presence of ministers or senior representatives from ministries at national events such as the awareness seminars and national dissemination or launch seminars tends to attract more television and newspaper coverage and thereby serves to disseminate information more effectively. Their presence would also be a great help in convincing industries about the growing importance of cleaner production and energy efficiency options and in motivating them to implement such options.

Lesson 5: External Consultants are Important for Bringing in Vital Expertise and New Ideas and for Enhancing Project Credibility

In the GERIAP project, many national focal points would not have been able to complete the work without the help of external consultants. Using consultants often gave the national focal point and the project credibility with the participating plants, especially the larger ones. This was mentioned several times in the minutes of the advisory board meetings of the project.

Lesson 6: Small- and Medium-scale Enterprises

Experiences of the GERIAP project show that implementation of cleaner production and energy efficiency options is more effective in small- and medium-scale enterprises: they are normally responsive to suggestions and appear to regard participation in such projects as an opportunity to build in-house cleaner production and energy efficiency capacity and to reduce production costs through energy saving and waste treatment cost reduction, thereby improving competitiveness and compliance with environmental regulations.

6. Recommendations

A number of recommendations are presented below; these are mostly based on the five lessons learned listed above. Recommendations 1 to 6 are directed towards all donor agencies that may be interested or concerned; recommendation 5 is also directed towards national government agencies, institutes, non-governmental organizations or industry associations. Recommendation 7 is on a sequel to the GERIAP project and is specifically directed to UNEP and Sida; this recommendation should be taken as a strong endorsement for a follow-up project, and the details given should be regarded as outlining a flexible guideline.

Recommendation 1:

A regional follow-up initiative to GERIAP should take special care in selecting national focal points. National cleaner production centres and similar organizations are best as national focal points. Establishing such centres in countries where they do not exist at present, as in Bangladesh and Thailand, is recommended to ensure effective promotion of cleaner production and energy efficiency and greenhouse gas emission reduction in industrial sectors.

Recommendation 2:

The Clean Development Mechanism is an important mechanism for improving viability of greenhouse gas emission reduction projects through certified emission reduction credits. Although the Clean Development Mechanism may not continue to exist in exactly its present form after 2012, there is little doubt that similar mechanisms will be in place for many years to come. It is therefore likely that significant greenhouse gas mitigation efforts in developing countries will be carried out under the umbrella of the Clean Development Mechanism (or a similar mechanism in the future). It would be important for a follow-up phase of the GERIAP project to include cleaner production and energy efficiency options leading to greenhouse gas emission reduction under the umbrella of the Clean Development Mechanism as well. Capacity-building of the existing national cleaner production centres on energy efficiency and greenhouse gas mitigation, as well as Clean Development Mechanism methodologies regarding industry-sector projects, is therefore strongly recommended. (It is interesting that at least one national focal point, the Viet Nam National Cleaner Production Centre, has already initiated a project to build its own Clean Development Mechanism-related capacity.)

If this is not possible, the national focal points of any follow-up projects should have cleaner production and energy efficiency expertise and link with a partner institute with expertise on Clean Development Mechanism methodologies. It is recommended that the national focal points should also have sector-specific expertise or close working relationships with an organization with such expertise so that sector-specific cleaner production, energy efficiency and greenhouse gas emission reduction options can be

properly identified and assessed. It would be important for a future national focal point to have either in-house expertise on cleaner production, energy efficiency, industry sector greenhouse gas mitigation or the Clean Development Mechanism methodology, or access to that range of expertise through its partnership with other organizations. It could then provide a one-stop window for industrial plants to identify and implement these options and for the national government to promote cleaner production and energy efficiency options leading to greenhouse gas emission reductions in industry, whether under the Clean Development Mechanism or not.

Capacity-building of industrial plants on the Clean Development Mechanism for screening projects to check their eligibility and roughly estimate the expected magnitude of greenhouse gas emission reduction compared to a reasonable baseline would be useful. It would encourage industrial plants to identify cleaner production, energy efficiency and greenhouse gas mitigation projects. Once companies have identified viable Clean Development Mechanism projects, they could seek external consultant assistance to develop formal Clean Development Mechanism proposals. The companies' ability to screen Clean Development Mechanism projects would eliminate the risk of hiring consultants for projects that would not yield any certified emission reduction. It is recommended that such capacity-building should be included in a follow-up project.

Recommendation 3:

Although the GERIAP project has come to end, there is an even greater need to promote cleaner production and energy efficiency in industrial plants today in view of the rising costs of fossil fuels, particularly oil. Also, there is a greater possibility of supply disruptions and acute energy crises in the future as world oil production approaches its peak, which, according to some studies, may occur in less than 10 years. Developing countries may also have some commitment to reducing greenhouse gas emission after 2012. Future GERIAP type projects should build awareness of the importance of cleaner production, energy efficiency and greenhouse gas mitigation. Involving top managers of industrial plants, industry associations and chambers of commerce in national awareness meetings and seminars specially organized for the industry sector is strongly recommended. Including developing country achievements or experiences regarding industrial energy conservation, for example, in Thailand and India; introducing the Clean Development Mechanism and related industry sector projects and voluntary cleaner production, energy efficiency and greenhouse gas emission reduction experience in developed countries is also recommended and would serve to highlight the fact that energy conservation and greenhouse gas emission reduction projects are important for all concerned to consider.

Recommendation 4:

Involvement of key national stakeholders, particularly senior policy personnel and top managers from industrial plants and representatives of industry associations, in the project is recommended. Involving policy personnel in a project proposal formulation or finalization workshop would be important so that national priorities and constraints could be taken into account at the proposal stage. Inviting policy personnel and representatives of industry associations to annual advisory board meetings is also recommended as it would facilitate the use of project findings as input for policy formulation.

Recommendation 5:

The GERIAP project should be replicable at other industrial plants similar to those that participated if the guide and case studies of GERIAP plants are disseminated among them, particularly if their capacity is built up to a certain level. Since the processes at these plants are similar to those of the GERIAP plants, it should be possible to achieve similar cost and energy savings through implementation of similar cleaner production and energy efficiency options. Since the guide is already available in

several forms (book, CD-ROM and website) and in various Asian languages, capacity-building of more industrial plants in the GERIAP project countries would involve relatively low costs and is highly recommended. National government agencies, institutes, non-governmental organizations or industry associations could consider initiating information dissemination and capacity-building projects based on GERIAP project outputs; donor agencies, particularly UNEP and Sida, could consider promoting such projects by providing token or seed funding or support.

Recommendation 6:

The project should be replicable in other countries in the region as well. Since most of the training materials and a significant number of case studies are now available, it should be possible to replicate the project with relatively low funding levels in other geographical regions, for example, Latin America, Africa and Eastern Europe. Projects aimed at such replication are highly recommended, although translation and adaptation of materials would probably be required.

Recommendation 7:

Considering the growing importance of cleaner production, energy efficiency and greenhouse gas mitigation, a sequel to the GERIAP project to promote the options leading to greenhouse gas mitigation in industry in Asia is highly recommended. The follow-up project should also include greenhouse gas mitigation through implementation of energy efficiency options under the Clean Development Mechanism. In the advisory board meeting of January 2006, six of the nine GERIAP project national focal points pointed out that water was a high-priority concern in their countries; considering the growing concern about shortage of water in many places, the scope of the project could be broadened to promote efficient use of water in industrial establishments. Thus the overall objective of the follow-up project could be increasing overall efficiency of use of resources in industries in Asia – energy (though energy efficiency options, both under the Clean Development Mechanism and otherwise), water and other materials (though cleaner production).

In its meeting on 20 January 2006, the GERIAP project advisory board also recommended that the follow-up project should focus on resource use efficiency in industry. The project would then serve to promote sustainable industrial development in the participating countries by minimizing environmental impacts (air and water pollution, greenhouse gas emission and solid waste generation), conserving scarce resources (energy and water) and improving profitability of the industrial establishments through energy saving, thereby enhancing their competitiveness. Developing a methodology on efficient water use in industries is recommended for any follow-up project.

The following suggestions may be taken as constituting a flexible guideline (rather than a rigid prescription) for the follow-up project recommended above:

(a) Take into consideration recommendations 1 to 6 above;

(b) Update the equipment section of the GERIAP guide by including characterization of efficient or advanced industrial technologies and adding case studies and information on the Clean Development Mechanism methodology for industrial energy efficiency projects;

(c) The policy guidance manual prepared by the GERIAP project secretariat based on the energy efficiency survey, the policy review on improving energy efficiency in industry in Asia and the regional stakeholder workshop should be actively disseminated among national policymakers under the follow-up project and should also be hosted on the guide website;

(d) The type and impact of the national dissemination seminars of the GERIAP project varied widely from country to country; thus, there were 30 participants each in China, India and the Philippines

compared with 70 each in Sri Lanka and Thailand. Similarly, the programme of the guide launch seminar was quite different in different countries; for example, 95 participants with many from non-participating industrial establishments in Sri Lanka compared with a much lower number of total and industrial-sector participants in India. It is recommended that national awareness-building and dissemination seminars should be made more effective by establishing guidelines regarding these events, for example, with regard to expected number of participants and the stakeholder groups to be invited, with particular emphasis on the presence of ministers or senior government officials and media. It would be a good idea to allocate funds for the national seminars separately based on the number of participants and actual expenses involved so national focal points are not tempted to divert resources to be used for these events to other national activities of the project;

(e) The lack of proper information systems and good quality data was a serious limitation on assessing cleaner production and energy efficiency options in many GERIAP plants; often, shortcuts in the energy efficiency methodology had to be used because of this. A follow-up project should focus on getting the proper, required, right data about industrial plants; this would help in unambiguously establishing how and where energy or water is used in a plant as well as the energy or water wastage taking place, and in getting company management commitment;

(f) It is recommended that over the next few months UNEP should draft a regional project proposal as a follow-up to the GERIAP project by considering the lessons learned from the project and the recommendations as outlined above. UNEP could identify a potential sponsoring organization, preferably Sida, and then organize a regional proposal finalization workshop. Suggested participants for this workshop include representatives from potential national focal points (some of which will be included in the project), representatives of UNEP Regional Office for Asia and the Pacific, one or two international experts, national policy personnel (preferably one from each potential participating country), a few industry representatives and a donor representative. As indicated in recommendation 4, the presence of policy personnel in a project proposal formulation or finalization workshop would be important so that national priorities and constraints could be taken into account in the project proposal. Inviting policy personnel and representatives of industry associations to annual advisory board meetings is also recommended as it would facilitate the use of the project findings as input for policy formulation at country and company levels;

(g) Once the proposal is accepted by a donor and funding becomes available, a project coordinator should be appointed to select participating countries and national focal points and then launch the project. Only countries which show strong support for the project, preferably committing additional resources, and where suitable national focal points can be identified, should be considered for inclusion in the project. Ideally, the national focal points should have adequate expertise on cleaner production-energy efficiency-greenhouse gas mitigation and Clean Development Mechanism methodology as well as sector-specific expertise, either in-house or in a network with partner institutes;

(h) The participating industrial plants should be selected carefully to ensure that management commitment is available from the highest level and preferably to ensure that a senior manager is available to lead the plant project team. Also, industrial establishments which do not have adequate expertise and resources should be given preference over establishments which have expertise and resources of their own or which are part of multinational companies. Considering the experience of the GERIAP project, it may be advisable for the follow-up project to focus on small- and medium-scale enterprises. This is in line with the recommendation of the GERIAP advisory board meeting of 28 January 2005 that the follow-up project should focus on small- and medium-scale enterprises. It may also be a good idea to target a cluster of industries, for example, industrial parks, to have a visible local impact and make implementing project activities and monitoring easier. Plants located in a cluster are likely to gain by learning from each other. The Indian national focal point, in its feedback to the evaluator, also suggested that a follow-up project should focus on small- and medium-scale industries and industries located in clusters or industrial parks.

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Annex I Terms of Reference

1. Background

Project rationale

Climate change poses one of the most serious threats to the global environmental today. While the need to take action to reduce the greenhouse gas emissions has been recognized at the highest political level (the sixth meeting of the Conference of the Parties to the Framework Convention on Climate Change), practical means to address the problem at local level are still largely absent, especially for industry in developing countries. Measures to improve the generation and use of energy in industrial processes do exist but are generally difficult to access for individual companies in developing countries. Furthermore, many companies are not aware of the need to improve the energy efficiency on their processes and the potential benefits of doing so. While there is limited institutional capacity for information exchange and promotion of energy efficiency, there is a need to make information available and to provide examples to industry on how to adopt such measures and, finally, to support governments in encouraging industry to seek to improve their energy efficiency.

The need exists at two levels. At the country level there is a need for examples of what can be done practically to improve the energy efficiency in production processes and for guidance to individual companies on how to practically improve their energy efficiency. At the intergovernmental level there is a need for good experiences to be shared and discussed in a manner that favourably affects the intergovernmental processes. With limited institutional capacity in most developing countries on energy and environment issues, support and advice to governments, industries and individual energy consumers on sustainable energy policies and strategies is both critical and welcomed. This can be expressed in needs for capacity-building at local, national and regional levels; provision of data, methodologies and tools; and direct technical support to and collaboration with relevant government institutions, industries, researchers and non-governmental organizations.

The objective of the project was to develop and practically demonstrate a mechanism for encouraging company-level actions to increase the efficiency of energy use in their production processes, thereby reducing associated emissions, especially of greenhouse gases. The mechanism is based on the cleaner production approach to environmental management, where the combined environmental and economic benefits that can be achieved simultaneously encourage the companies to take action on their own. The initial overall expected results of the project would (as per logical framework matrix provided in the project document) include:

(a) Established and tested methodology for how to identify and implement greenhouse gas emission reduction measures at company level in the iron and steel, cement and lime, pulp and paper, and chemicals sectors;

(b) Improved awareness and capacity in targeted industry sectors in the region on the need and practical options to improve production efficiency and reduce waste and emissions through application of the cleaner production methodology, especially with regard to energy production and consumption;

(c) Improved understanding of policy options for promoting greenhouse gas emission reduction measures in industry;

(d) Reduced greenhouse gas emissions from targeted industry sectors (in the short term from companies participating in the project and in the longer term from the sectors as a whole).

Legislative authority

The legislative authority for the GERIAP project stems from Agenda 21, chapter 38 (creating capacity for sustainable development), UNEP Governing Council decisions 16/11 IV (assisting developing countries in identifying climate-friendly technologies and technology needs), 17/32 (requesting the UNEP Executive Director to implement Agenda 21), 21/ (requesting the Executive Director to carry out response strategies to climate change and to support developing countries in meeting their commitments under multilateral environmental agreements), 21/18 (requesting the Executive Director to take further steps in the implementation of the Malmö Ministerial Declaration, with an emphasis on identifying means of bringing international commitment into action), and 21/24 (requesting the Executive Director to further strengthen activities in providing technical, legal and policy advice to governments and regional and subregional institutions dealing with environmental matters).

Relevance to UNEP subprogrammes

The project was designed to contribute to subprogramme 4, Technology, Industry and Economics 2002–2003 work programme:

- Objective 1: "To enhance global awareness of cleaner and safer production issues and improve knowledge and understanding of the use of environmental management tools and technologies for improving resource use and the avoidance of pollution, facilitating the integrated implementation of environmental agreements and codes and supporting establishment of national cleaner production centres."
- Objective 10: "To improve global investment in and use of renewable and non-carbon energy systems (renewable energy technologies), promote energy efficiency in the production of goods and the provision of services, and ensure that environmental factors are increasingly incorporated in the transport sector."
- Objective 11: "Strengthen awareness of and encourage industry and business to develop and adopt environmentally sound policies, strategies and practices."
- In addition to this the project supports the programme of work for UNEP subprogramme 5: Regional Cooperation and Representation, Objective 2: "To strengthen regional and subregional cooperation as well as national capacities for joint implementation of programmes to address global environmental issues and respond to emergencies."

Executing arrangements

The project is executed by the UNEP Division of Technology Industry and Economics at the Regional Office for Asia and the Pacific. The project partners are national focal points in the nine participating countries: Institute of Management Consultants Bangladesh (Bangladesh); State Environment Protection Administration (People's Republic of China); National Cleaner Production Centre (India); Ministry of Environment and BPPT (Indonesia); Ministry of Nature and Environment (Mongolia); Industrial Technology Development Institute (Philippines); Small and Medium Enterprise Developers (Sri Lanka); Thailand Institute of Scientific and Technological Research (Thailand); and Viet Nam Cleaner Production Centre (Viet Nam).

GERIAP activities

The project activities were clustered in three major components:

1. Capacity-building, especially training of national partners;
2. Practical demonstration and evaluation of the energy audit methodology by carrying out audits, preparing action plans and implementing the plans in a number of industrial plants in the most energy intensive sectors – the pulp and paper, iron and steel, chemicals production and lime and cement sectors;

3. Review, evaluation and recommendation for national policies and measures that can be taken to support and encourage the adoption of energy-efficient production methods in industry.

The original project duration was 36 months (January 2002–December 2004). Since its inception, the project has undergone four revisions and is now expected to be completed in June 2006.

Revision of project design

The original project design was revised in January 2003 by the project advisory board and the ceramics sector was included as a fifth sector because several countries had only one or two cement plants. The advisory board also reformulated project component 3, which was replaced by: "The policy evaluation block of GERIAP is reformulated. The block will be initiated with a review of external factors, including experiences from the implementation of action plans in the assessment plants. The findings will be discussed at a workshop and the synthesis published in a separate report."

Budget

The original budget was $2,534,000, comprising a counterpart contribution from the Swedish International Development Cooperation Agency (Sida) of $1,689,000 (66 per cent), in-kind contributions from participating countries of $500,000 (20 per cent) and an in-kind contribution from UNEP of $345,000 (14 per cent). The counterpart contribution by Sida increased to $1,950,991.29 as a result of a favourable exchange rate between the Swedish krona and the dollar. In addition, the available funds were redistributed over the individual budget lines during the project to reflect actual costs of activities and to accommodate changes in activities.

2. Objective and Scope of the Evaluation

The objective of this terminal evaluation is to assess the extent to which the goals and expected objectives of the GERIAP project have been achieved in an effective and efficient manner and provide recommendations and lessons from programme implementation in order to assist in determining whether to replicate and or design new projects in the future. The evaluation report will also discuss and recommend possible options for the future, including institutional and financial sustainability activities without the involvement of UNEP beyond project duration. The evaluation will cover the entire period January 2002 to June 2006 and include all nine countries in the Asia-Pacific region (Bangladesh, China, India, Indonesia, Mongolia, the Philippines, Sri Lanka, Thailand and Viet Nam). The evaluation should be conducted as desk studies in combination with field visits to three representative countries. The evaluation will cover five broad issues:

1. How appropriate is the GERIAP model for encouraging company-level actions to increase the efficiency of energy use in their production processes, thereby reducing associated emissions, especially greenhouse gases? If not appropriate, what improvements or modifications are required? In addition, was the project design or model appropriate to meet the project's objective and planned results in partner countries?

2. To what extent has the project been successful in enhancing the capacity of industry sectors and facilitating organizations to reduce greenhouse gas emission through efficient use of energy?

3. How successful has the project been in fostering partnerships among industry sectors in reducing greenhouse gas emissions through energy efficiency?

4. To what extent has the project been successful in assisting countries in formulating and implementing policies associated with reduction of greenhouse gas emissions through energy efficiency?

5. To what extent have experience and lessons learned through the GERIAP project been disseminated to a wider audience both within the United Nations system and to national policymakers, private-sector entrepreneurs, academic institutions, non-governmental organizations and the news media?

Terms

In particular, the evaluator shall conduct analysis on the following parameters defined (although this list should not restrict the evaluator to these areas only):

1. Attainment of objectives and planned results:
    - Evaluate how, and to what extent, the stated project objective has been met, taking into account the achievement indicators. In particular, to evaluate whether and to what extent the results of this project have informed national or regional policymakers in formulating energy efficiency products and services aimed at reducing greenhouse gas emissions;
    - Ascertain the contributions of project outcomes to date in building capacity for efficient use of energy leading to reduction in greenhouse gas emissions;
    - Assess the extent to which project outcomes to date have resulted in the sharing of knowledge across national boundaries;
    - Determine the extent to which external scientific and technical information and knowledge have been incorporated and have influenced the execution of the project activities;
    - Evaluate the strategy developed in the different industry sectors for identifying, promoting and supporting reduction in greenhouse gas emissions through energy efficiency. Is the strategy appropriate, successful and sustainable for the reduction in greenhouse gas emissions?
2. Achievement of outputs and activities:
    - Assess the scope, quality and usefulness of the project outputs in relation to its expected results;
    - Assess the soundness and effectiveness of the various assumptions, methodologies and tools developed as well as their relevance for energy efficiency and reduction in greenhouse gas emissions;
    - Assess the extent to which project outputs produced have the weight of scientific authority necessary to influence policymakers at the national and regional levels;
    - Assess the extent to which the project built sufficient institutional capacity to ensure sustained efforts to improve energy efficiency and reduce greenhouse gas emissions in industry sectors in project partner countries;
    - Evaluate the extent to which the project collaborated with other organizations (for example, UNIDO, UNDP, the Asian Institute of Technology and other organizations) in addressing greenhouse gas emission reduction in the project partner countries.
3. Implementation approach:
    - Ascertain to what extent the project implementation mechanisms outlined in the project documents have been followed;
    - Evaluate how appropriately implementation mechanisms have been adapted to the changing needs of the project;
    - Evaluate the effectiveness of project execution arrangements at all levels including (i) policy decisions through the project advisory committee; and (ii) day-to-day project management;
    - Assess the effectiveness of supervision and administrative and financial support provided by UNEP;
    - Identify administrative, operational and or technical problems and constraints that influenced the effective implementation of the project;

- Characterize the division of responsibility in the project, according to the plan and in reality (between the UNEP Division of Technology, Industry and Economics, the UNEP Regional Office for Asia and the Pacific, industry sectors, national focal points and the project secretariat). Focus particularly on the issue of building capacity of national focal points and industry sectors and whether the division of responsibility has been clear to all parties;
- To what extent have the linkages of the GERIAP activities supported policy development on energy efficiency and greenhouse gas emission reduction in partner countries?
- Evaluate how effectively the industry sectors and national focal points are performing against the envisaged work plan, their financial sustainability and ability to attract additional financing from other sources when needed;
- Identify how useful the project has been in fostering productive linkages with other similar initiatives in the region;
- Assess the degree and effectiveness of collaboration and coordination between the various project partners and institutions during the course of implementation of the project;
- Assess the extent to which the project received guidance and support from the UNEP Division of Technology, Industry and Economics, the Regional Office for Asia and the Pacific and national governments;
- Assess to what extent the GERIAP secretariat was effective in facilitating and coordinating project activities.

4. Stakeholder participation:

- Assess the mechanisms put in place by the project for identification and engagement of stakeholders and establish, in consultation with the stakeholders, whether this mechanism was successful, its strengths and weaknesses. Particular attention should be paid to the level of participation by national focal points, industry sectors and civil society organizations. Furthermore, the evaluation should assess gender-related issues in the project (for example, participation, roles, decision-making process and access to and control over resources).

5. Cost-effectiveness:

- Assess whether funds have been efficiently used by the organizations (the project secretariat, international and partner organizations) for undertaking project activities;
- Assess the cost-effectiveness of the project activities and GERIAP secretariat;
- Assess the contribution of cash and in-kind co-financing to project implementation and to what extend the programme leveraged additional resources;
- Identify factors which contributed in leveraging additional resources, if any.

6. Country ownership:

- Assess the level of country ownership. Specifically, the evaluator should assess whether the project was relevant for national development and environmental agendas and to regional and international agreements;
- Assess how committed the industry sectors and national governments are in formulating and implementing energy policies aimed at reducing greenhouse gas emissions.

7. Replicability:

   - Assess whether the programme has potential to be replicated, either in terms of expansion, or replication in other parts of the region and other regions, and whether any steps have been taken by the project to do so and the relevance and feasibility of these steps.

8. Monitoring and evaluation:

   - Determine the effectiveness of the reporting, monitoring and evaluation mechanisms employed throughout the project's lifetime and how effectively the project responded to the challenges identified through these mechanisms. The evaluator shall include an assessment of the quality and application of project monitoring and evaluation plans and tools, including an assessment of risk management based on the assumptions and risks identified in the programme document.

9. Impact:

   - Evaluate any visible and or identifiable immediate impact of the project on industry sectors, policy development and decision-making in the participating countries, and any other possible impacts.

10. Sustainability:

   - Ascertain to what extent the project outcomes will be sustained and enhanced over time. The sustainability assessment should include the enabling environment and institutional and financial sustainability. How useful has the GERIAP financial support been for the efforts towards the reduction of greenhouse gas emissions and enhancing energy efficiency?

   - Determine to what extent the industry sectors are committed to carrying forward initiatives and enthusiasms provided by the project.

The evaluator shall make strategic recommendations which would contribute to the future direction of the project based on lessons learned during its implementation. These recommendations should be clearly tagged to responsibility (who does what) and time line (by when) and should be made for each country and the overall project management team. Some of these recommendations may also be directed to Sida and other potential donors.

The evaluator will rate the overall implementation success of the project and provide individual ratings of implementation aspects as described in section III of these terms of reference. The ratings will be presented in a tabular format with adequate evidence-based justification for each rating based on the findings of the main analysis.

Furthermore, the evaluation should highlight lessons learned, both positive as well as negative, from the standpoint of the design and implementation of the project.

The evaluation should also include a breakdown of actual costs and co-financing for the programme prepared in consultation with the relevant UNON fund management officer of the project.

3. Methodology

This terminal evaluation of the GERIAP project will be conducted as an in-depth evaluation using a participatory approach whereby the UNEP programme officer and other relevant key stakeholders are kept informed and regularly consulted throughout the evaluation. The evaluator will consult with the UNEP Evaluation and Oversight Unit and the UNEP programme officer on any logistical and or methodological issues to properly conduct the evaluation in an independent way. The findings of the evaluation will be based on a comprehensive analysis and include the following:

1. A desk review of programme documents including but not limited to:

   (a) The programme documents, outputs, monitoring reports (such as progress and financial reports to UNEP headquarters, progress reports, self-evaluation reports and relevant correspondence);

   (b) Review of specific products and outputs including technical and financial models, technical information, research results, methodological guidelines, strategies and recommendations related to wider application of the generic tools and methodological approach developed by the project;

   (c) Notes from the advisory board meetings;

   (d) Other material provided by the project secretariat, national focal points and industry partners in both hard and soft forms.

2. Telephone and/or in-person interviews with project-related staff at UNEP headquarters, the Regional Office for Asia and the Pacific, the Division of Technology, Industry and Economics, Sida and other project partner institutions as well as other relevant donor representatives with substantive presence in Bangkok. In-depth, face-to-face interviews will be conducted in three representative countries (Thailand and two other countries).

The success of project implementation will be rated on a six-point scale: 1= highly satisfactory, 2 = satisfactory, 3 = moderately satisfactory, 4 = moderately unsatisfactory, 5 = unsatisfactory and 6 = highly unsatisfactory. The following parameters should be considered for rating purposes:

- Attainment of objectives and planned results
- Achievement of outputs and activities
- Implementation approach
- Stakeholder participation
- Financial planning
- Cost-effectiveness
- Country ownership
- Replicability
- Monitoring and evaluation
- Results and impact
- Sustainability

The evaluator will analyse as far as possible all the terms of evaluation discussed in section II. Wherever the evaluation terms are not relevant to the project, the evaluator will clearly identify them and provide substantiated justification.

4. Evaluation Report Format and Procedures

The evaluation report shall be a detailed report, written in English, of no more than 30 pages (excluding annexes) and include:

(i) An executive summary (no more than three pages);

(ii) Introduction and background;

(iii) Scope, objective and methodology;

(iv) Project performance and impact as per above listed 11 parameters;

(v) Conclusions and rating of project implementation success with justification;

(vi) Lessons learned;

(vii) Recommendations;

(viii) Annexes.

The final report shall be submitted in electronic form in Microsoft Word format and should be sent to the following people:

Segbedzi Norgbey
Chief, Evaluation and Oversight Unit
UNEP, P.O. Box 30552, Nairobi, Kenya
Tel.: (254-20) 623387
Fax: (254-20) 623158
E-mail: segbedzi.norgbey@unep.org

With a copy to:

Monique Barbut, Director
UNEP/DTIE
39/43 quai Andre Citroen
75739 Paris Cedex 15 France
Tel: +33-1-44 37 1441
Fax: +33-1- 44 37 14 74
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The evaluation report will be printed in hard copy and published on the Evaluation and Oversight Unit's website www.unep.org/eou.

5. Resources and Schedule of the Evaluation

The contract for this evaluation will begin on or about 17 April 2006 and end on 26 June 2006 (six weeks spread over 10 weeks). The consultant will submit a draft report to the Evaluation and Oversight Unit on or before 5 June 2006, with a copy to the UNEP programme officer for initial comments. Comments on the final draft report will be sent to the consultant by 19 June 2006 at the latest, after which the consultant will submit the final report no later than 26 June 2006. The Consultant will be required to travel to Thailand and visit two additional project partner countries to collect primary data, interview key stakeholders and visit sample industries participating in the project activities. The two additional countries will be determined following the consultant's review of documents and visit to Thailand, and in consultation with the Evaluation and Oversight Unit of UNEP.

In accordance with UNEP policy, all projects and subprogrammes are evaluated by an independent evaluator contracted by the Evaluation and Oversight Unit. The evaluator should not have been associated with the design and implementation of the project. The evaluator will be required to sign a statement confirming that he or she has had no conflict of interest in any form in undertaking this assignment. The evaluator will work under the overall supervision of the Chief, Evaluation and Oversight Unit, UNEP. He or she should have the following minimum qualifications: (i) experience with greenhouse gas emission reduction projects; (ii) scientific expertise in the subject matter (energy efficiency and greenhouse gas emission reduction in the industry sector supported by the project; and (iii) experience in project or programme evaluation. The evaluator should preferably be from the Asia-Pacific region, and knowledge of UNEP programmes and activities is highly desirable.

6. Schedule of Payment

The evaluator will receive a lump-sum payment to cover professional fees, travel and other expenses for field visits to Thailand, and telecommunication expenses. The project secretariat will make separate arrangements for travel to two other countries and reimburse travel-related expenses to the consultant. The lump-sum amount will be payable in three parts. Upon signing the contract she or he will receive 30 per cent and another 30 per cent upon submission of the draft report. Final payment of 40 per cent will be made upon satisfactory completion of work and acceptance of final report.

In the event that the evaluator cannot provide the products in accordance with the terms of reference or the time frame agreed, or his products are substandard, the payment to the evaluator could be withheld until such a time as the products are modified to meet UNEP standards. In the event that the evaluator fails to submit a satisfactory final product to UNEP, the product prepared by the evaluator may not constitute the evaluation report.

Annex II People Met during Field Trip

UNEP Regional Office for Asia and the Pacific

Ms. Sophie Punte, GERIAP Coordinator

Ms. Wei Zhao, Regional Industry Officer

Mr. Henk Verbeek, UNEP-Regional Office for Asia and the Pacific Administrative Officer

Mr. Surendra Shrestha, Regional Representative, UNEP Regional Office for Asia and the Pacific

Thailand

1. Thailand Institute of Scientific and Technological Research
   Dr. Wirachai Soontornangson
   Dr. Thanes Utistam
2. Medigloves Limited
   Mr. Sompong Virakananon, General Manager
   Mr. Paranai Chetananon, Maintenance Engineer Supervisor
   Mrs. Pavilai Pungsrinon, Welfare staff Relation & Training Supervisor
3. Lime Master Co. Limited.
   Mr. Kitiwat Udomrat, Managing Director

Viet Nam

1. The Viet Nam National Cleaner Production Centre
   Dr. Ngo Thi Nga, Director
   Mr. La Tran Bac, Cleaner Production Junior Expert (project coordinator)
   Mr. Dinh Manh Thang, Cleaner Production Expert
   Dr. H.L. Pham
2. Viet Tri Paper Company
   Mr. Pham Duc Tao, Head of Technical Department
   Mr. Nguyen Hong Ha, Manager of Plant No 2
   Mr. Nguyen Minh Hai, Responsible for Safety and Environmental Issues
   Mr. Tran Quoc Binh, Head of boiler house

Indonesia

1. BPPT (Agency for the Assessment and Application of Technology)
   Dr. Kardono
   Ms. Widiatmini Sih Winanti
   Ms. Indriyati
   Mr. Wiharja
   Mr. Djoko Padmono
   Mr. Prasetyadi from Ministry of Environment
   Ms. Upik S Aslia from Ministry of Environment

2. Pindo Deli Pulp:
   Mr. Himawan Anwar
   Mr. Suwandi Mulyono
   Mr. Ferry Sugiantono
   Mr. Yuswendi
   Mr. Nugroho
   Mr. Ujang
3. Holcim Cement
   Mr. Irianto
   Mr. Didik Dirgantoro
   Mr. Lilik Rendra
4. PT. Indocement Tunggal Prakarsa
   Mr. Benedictus Bambang Suprapto

Annex III People Contacted by Telephone or E-mail

Sida (Sweden):

Sara Stenhammar

UNEP Division of Technology, Industry and Economics (Paris)

Mr. Niclas Svenningsen

National focal points:

Dr. Saidul Haq, Bangladesh

Ms. Tian Chunxiu, China

Dr. Rajiv Garg, India

Ms. Indriyati, Indonesia

Dr. Alice Herrera, Philippines

Mr. Nihal Cooray, Sri Lanka

Annex IV Questionnaires used to Collect Data by Telephone and In-person Interviews

a. List of questions for national focal points

1. What do you think are the most important results of the GERIAP project?
2. Do you think that the project has successfully demonstrated how to implement cleaner production-energy efficiency options in order to reduce energy consumption and associated emissions in industrial plants and encouraged industry to consider more cleaner production and energy efficiency projects in the future?
3. How have you disseminated the GERIAP results among national policymakers?
4. Were key policy personnel present in national dissemination events (awareness meeting, stake-holder workshops, CD launch and so on)? Did you get any important feedback from these events?
5. Did you find the GERIAP training of trainers (2003) useful? What improvements would you suggest for such training in the future?
6. Do you think the national- and plant-level training sessions and round tables were effective? Did you receive any feedback from these? Please explain. (Also indicate: the number of people trained; the qualifications or position of the people trained; and the length of the training period in person-days).
7. How have you shared knowledge with national focal points of other countries? Have you visited or attended national seminars in any other country to share experience? How have you benefited from such sharing?
8. How useful do you think are the main outcomes of the project (such as the guidebook and website, capacity-building and so on)?
9. The emphasis of the present project was mainly on cleaner production and energy efficiency. What changes would you suggest for adapting the GERIAP strategy for greenhouse gas emission reduction?
10. What feedback have you received so far on the quality and usefulness of the project's outputs? List the sources and comments.
11. What further capacity-building do you think is needed to reduce greenhouse gas emissions in industry?
12. Give a picture of day-to-day project management at the national focal point. What improvements would you suggest?
13. Did you find the project execution arrangements satisfactory?
14. What were the main problems and constraints you encountered in implementing the project?
15. Do you think that the GERIAP project has directly or indirectly resulted in initiation of any policy measures? Please explain.
16. Do you think that industry sectors are performing as expected?
17. Did the project have any linkages with similar projects in the country?

18. How effective were national focal point to national focal point partnerships, national focal point to plant collaboration, and national focal point to GERIAP collaboration? Please explain.
19. Has the project received any guidance and support from your government?
20. How effective was the project coordination? What problems have you faced regarding project coordination in carrying project activities?
21. How were the stakeholders identified?
22. Was stakeholder participation satisfactory?
23. Was any stakeholder feedback used to change the project activities?
24. Were any gender-related issues considered or addressed in the project formulation or implementation?
25. Were the project outputs disseminated among national non-governmental organizations and researchers?
26. Do you think that the project outputs met or exceeded the expected outputs?
27. How relevant do you think the project is to the development and environmental agendas of your country?
28. Are you planning to initiate a similar project in the future?
29. What is your opinion about replicability of the project (in other industrial plants or sectors)?
30. How effective was monitoring of the project?
31. What are the major impacts of the project in your country (capacity, other projects, new policies, awareness and so on)?
32. Which outcomes of the project do you think will continue to significantly benefit different stakeholders after it is over?
33. Do you have any suggestions for improving impact and success of such projects in the future?

b. Questions for GERIAP coordinators

1. How have you disseminated the important results of the project among national and regional policymakers?
2. Were key policy personnel present in regional and national dissemination events (awareness meetings, stakeholder workshops, CD launch, other events or avenues)? Give examples.
4. Do you think the regional-, national- and plant-level training sessions and round tables were effective? Do you have any suggestions to improve training in future projects?
5. Do you think the different mechanisms for information sharing across national boundaries were satisfactory? Have you received any feedback regarding this? Do you have any suggestions for improving future projects?
6. The emphasis of the present project was mainly on cleaner production and energy efficiency. What changes would you suggest for adapting the GERIAP strategy for greenhouse gas emission reduction?

7. What is your opinion about the quality of the project outputs? What actions or changes could have improved their quality and usefulness? Have you received any feedback about the quality and usefulness of the project outputs?

8. What further capacity-building do you think is needed to reduce greenhouse gas emissions in industry?

9. What was the nature of your working relationship with UNEP Regional Office for Asia and the Pacific and the UNEP Division of Technology, Industry and Economics and collaboration with other organizations?

10. Do you think the adaptation of the project implementation mechanisms to changing needs was quick and satisfactory? What were the major actions taken for adaptation?

11. What improvements would you suggest regarding day-to-day project management at the UNEP project office, national focal point and plant levels for a possible follow-up project?

12. Did you find the project execution arrangements satisfactory? What changes would you like to suggest for a possible future project?

13. What was the role of UNEP in terms of supervision and administrative and financial support?

14. What were the responsibilities of the UNEP Division of Technology, Industry and Economics, the UNEP Regional Office for Asia and the Pacific and the project secretariat? Did you face any problem of overlap of responsibilities?

15. What were the main problems and constraints you encountered in coordinating the project?

16. Do you think the GERIAP project has directly or indirectly resulted in any national policy initiatives?

17. Do you know of any new regional or national initiatives similar to GERIAP?

18. Do you think that national focal points and industry sectors are performing as expected?

19. Did the project have any linkages with similar initiatives?

20. How effective were national focal point to national focal point partnerships, national focal point to plant collaboration, and national focal point to GERIAP collaboration? Please explain.

21. How has the project received guidance and support from UNEP and national governments?

22. How were the stakeholders identified?

23. Was stakeholder participation satisfactory?

24. Was any stakeholder feedback used to change the project activities?

25. Were any gender-related issues considered or addressed in the project formulation or implementation?

26. Were the project outputs disseminated among national stakeholders not directly involved in GERIAP project activities, for example, non-governmental organizations, researchers, other industrial plants and industry sector representatives?

27. Were there any Sida or UNEP guidelines for fund use by the project as a whole: for the GERIAP secretariat, instrument procurement, national focal points and plants? How closely have these been followed?

28. Do you think the project outputs met or exceeded the expected outputs?

29. What is your opinion about the cost-effectiveness of the project activities and GERIAP secretariat?

30. How do you think the project compared with similar regional initiatives in terms of cost-effectiveness?

31. What was the contribution of cash and in-kind co-financing to project implementation? What factors contributed in leveraging additional resources, if any?

32. What is your opinion about replicability of the project?

33. Did you face any problems regarding monitoring and evaluation of the project? What improvements would like to suggest for a possible future project?

34. What major impacts do you think the project had in the region?

35. Which outcomes of the project do you think will continue to significantly benefit different stakeholders after it is over?

36. What should be done as follow-up to the project to make use of the interest and momentum generated by the project for promoting cleaner production and energy efficiency options in the industries to reduce greenhouse gas emissions?

37. What is the most important lesson you have learned as the GERIAP coordinator that can be considered in formulating new initiatives or a follow-up project?

38. Criteria for identifying national focal points and your suggestion. What countries should be included?

Annex V National Awareness Seminars in GERIAP Countries

Country	Date	No. of participants
Bangladesh	16 May 2003	60
China	5 April, 2004	30
India	30 June 2003	30
Indonesia	1 April 2003	60
Mongolia	14 August 2003	25
Philippines	16 July 2003	30
Sri Lanka	24 April 2003	70
Thailand	14 March 2003	70
Viet Nam	3 June 2003	50

Annex VI GERIAP Budget 2002–2005 and Suballotment for 2006

Summary GERIAP budget 20 April 2006		
a. Received (Sida)	1,950,991	
b. Spent		
2002	156,977	
2003	736,836	
2004	449,350	
2005	412,234	
	1,755,397	
c. Left for 2006 (a–b)	195,595	
d. Suballotment 2006	126,700	old
	195,595	revised
	68,895	difference

GERIAP budget 2002–2005 and suballotment for 2006

UNEP project:	CP4060-02-01: GERIAP: CPL-E077-2641
Financial year:	2006
Project symbol:	CP462010

Object	Description			Updated on 7 April 2006		
		Suballotment (NEW)	Suballotment (OLD)	Obligated (calculated)	IMIS report	Balance for the month
110100	Project personnel	74,000	65,000	31,875.53	31,875.53	33,124.47
120600	Develop policy guidance manual	20,500	5,000	2,589.06	2,589.06	2,410.94
132100	Total stipend/fees/etc.	40,000	4,200	2,812.11	2,812.11	1,387.89
160100	Travel of project secretariat staff	16,000	13,500	10,596.51	2,442.59	2,903.49
220200	Memorandum of understanding with India	18,000	5,000	3200.00	3,200.00	1,800.00
230200	Printing of four sector-specific guidance documents	3,095	1,500	123.57	123.57	1,376.43
310100	Group training	10,000	16,100	3,441.00	(1,211.67)	12,659.00
530100	Other fund sources – Miscellaneous	2,000	1,400	5.63	5.63	1,394.37
550100	Evaluation consultant	12,000	15,000		-	15,000.00
	Total	**195,595**	**126,700**	**126,700.00**	**41,836.82**	**72,056.59**
	Available	195,595				

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