

Report of the Outcome Evaluation on Energy

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The Outcome Evaluation in-country mission took place from September 12 to October 9, 2008. It was conducted by Mr. Rogelio Z. Aldover, an Energy, Environment and International Development Consultant as Team Leader, together with Dr. Xuejun Wang of Peking University (for energy efficiency) and Ms. Lv Fang of Beijing Jikedian Renewable Energy Development Center (for renewable energy and CDM) as National Consultants.

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Acronyms

ADB	Asian Development Bank
APR/PIR	Annual Project Report/Project Implementation Review
CDB	China Development Bank
CDM	Clean Development Mechanism (of the Kyoto Protocol)
CDP	Country Development Plan
CER	Certificate of Emission Reduction
CFC	Chlorofluorocarbon
CICETE	China International Center for Economic and Technical Exchanges
CO ₂	Carbon dioxide
COP	Coefficient of Performance
CPD	Country Program Document
EE	Energy Efficiency
ERI	Energy Research Institute
EUEEP	End Use Energy Efficiency Project
FCB	Fuel Cell Bus
GEF	Global Environmental Facility
GHG	Greenhouse gases
GoC	Government of China (People's Republic of China)
GW	Gigawatts
IPHE	International Partnership for Hydrogen Economy
KW	Kilowatts
LPIC	Local Policy Implementation Committee
MDG	Millennium Development Goals
MEP	Ministry of Environmental Protection
MOA	Ministry of Agriculture
MOST	Ministry of Science and Technology
NDRC	National Development and Reform Commission
NEDO	New Energy and Industrial Technology Development Organization
NPD	National Project Director
pCDM	Programmatic Clean Development Mechanism
PIC	Policy Implementation Committee
PMO	Project Management Office
PRODOC	Project Document
R&D	Research and Development
RCF	Revolving Capital fund
RE	Renewable Energy
RET	Renewable Energy Technology
RFP	Request for Proposals
SARS	Severe Acute Respiratory Syndrome
TPR	Tripartite Review
TVE	Towns and village Enterprises
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNF	United Nations Foundation
UNFCCC	United Nations Framework Convention on Climate Change
UNTGCCEE	United Nations Theme Group on Climate Change, Energy and Environment
VA	Voluntary Agreement
WB	World Bank

Executive Summary

BRIEF DESCRIPTION OF THE UNDP CLIMATE CHANGE AND SUSTAINABLE ENERGY PROGRAMME

The phenomenal economic growth and the world's largest national population of China and its extensive dependence on coal and petroleum have led to many critical and massive environmental effects. Due to its CO₂ intensive energy production due to coal, China will become the world's biggest CO₂ emitter before 2010, thus overtaking the U.S.A. for that matter. The different projects in renewable energy (RE), energy efficiency (EE) and clean development mechanisms (CDM) have been helping China expand its industrial and commercial infrastructures to include clean and sustainable renewable energy and energy efficiency technologies and comply with global climate change commitments.

Introducing new and renewable energy and improving energy efficiency in industry, transportation, construction, residential and other areas will have to play very important roles in the process but commercializing these technologies have many challenges and also have many opportunities as well.

As UNDP develops local capacity, it draws on stakeholders and a wide range of partners through a partnership arrangement based on mutual benefits and cooperation. According to the Country Development Plan (CDP) 2006 -2010 UNDP China is expected to have proposals and recommendations for favorable policies and approaches for EE, RE and CDM.

In China, UNDP supports over 50 energy and environment projects valued at USD 500 million. The UNDP/GEF in their climate change programs actively seeks partnerships with public-private sectors to shift towards lower-carbon economy, green technologies and new source and mechanisms for financing related projects.

The projects covered in this UNDP Outcome Evaluation include the following:

1. Capacity Building for the Rapid Commercialization of Renewable Energy in China (CPR/97/G31)
2. China End-Use Energy Efficiency Project (CPR/02/G32)
3. Barrier Removal for the Widespread Commercialization of Energy-Efficient CFC-Free Refrigerators in China (CPR/98/G31)
4. Energy Conservation and GHG Emissions Reduction in Chinese Township and Village Enterprises (TVE) – Phase II (CPR/99/G31)
5. Building Capacity for the Clean Development Mechanism (CDM) in China (CPR/01/002 (CPR/02/H02)
6. China Millennium Development Goals (MDG) Carbon Facility (CPR/06/305)
7. Demonstration for Fuel-Cell Bus Commercialization in China – Phase II (CPR/07/G36)

EVALUATION ISSUES AND SCOPE OF EVALUATION

This independent Outcome Evaluation is part of the Evaluation Plan of UNDP China which was adopted in January 2007 for the Country Programme Document (CPD) for the cycle 2006 – 2010. Along UNDP's results-based management, this Outcome Evaluation aims primarily to review the participatory programming approaches in the selected RE and EE projects whether they bring together a broad range of partners in comprehensively achieving the UNDP outcome in this regard.

The specific outcome related to this evaluation falls under the Focus Area on Climate Change and Sustainable. The expected outcome is:

UNDAF Goal: Outcome 3 – More efficient management of natural

resources and development of environmentally friendly behavior to ensure environmental sustainability

There are many program components and elements involved which are in one way or another provided by each of the above projects towards the said outcome.

The approach and methodology of evaluation therefore has to view each project as following a programmatic and integrated multi-year developmental process not only from the viewpoint of the UNDP Country Program for China but also on the overall China national context.

It is assumed at the outset of evaluation that every project was designed for specific purpose and may happen to include some, but not all, of the components and elements of the intended outcome. This evaluation attempted to look at how each of the projects has contributed to the different elements of the intended outcome. It is not the purpose of this outcome evaluation to evaluate these seven (7) RE and EE and related CDM projects, but rather assess how each project has been contributing, individually and collectively, to the achievement of the intended outcome.

KEY FINDINGS

Outcome Analysis

1. The seven (7) RE, EE and CDM projects reviewed show that indeed, they result to sustainable development in the industrial sector, remote villages, town and village enterprises, transportation, residential and commercial sectors and have produced outcomes that are exceeding the project expectations.
2. Availability and improved access to modern and efficient energy use have been demonstrated to have provided beneficial results in lighting, transportation, communications, livelihood opportunities, education, health and sanitation, governance, manufacturing enterprises, agriculture, electrification, water supply and many other public services.
3. Because of the inherent need for cooperation and resource inputs towards common goals and objectives, the projects have developed and established systems that improve coordination, working relationships and performance of roles among partners, government agencies, public-private co-operation, and donor agencies not only on the project and program levels but also on the national level. The strategy also draws strong commitment and ownership by all stakeholders.
4. The projects have established (or in the final stages of developing in two projects) standards in the different technologies and services covered. These standards and guidelines are approved by the relevant government agencies and adopted together with the all other standards and guidelines established. This Evaluation noted the remarks by persons interviewed that the secret of success in drawing the various stakeholders into these kinds of industry settings is the credibility and capacity building brought in by UNDP using international best practices and expert advice directly or indirectly supported by the projects.
5. The projects were successful in bringing in market-oriented approaches applicable to RE and EE technologies and suitable to the evolving economic and business situation in China. The availability of seed moneys and international consultancy inputs from UNDP or brokered by UNDP with the partners are the key ingredients to success.
6. The agencies involved in the projects have consciously included climate change in the energy planning and project prioritization process because it is already mandated and are reflected in the related laws and regulations in China.
7. The awareness and realization of the need to integrate climate changes issues in the decisions made in the project, program and national levels have been observed by the Evaluation. The effective use of media has increased the awareness of common people, government agencies and private companies.

8. The success has also been mainly through the acceptance to get involved and willingness to provide inputs by the private sector and civil society in a market-based approach. The inputs placed by the private sector also complemented the resources the GoC can put up to meet the total requirements of a big program like the EE and RE program.

Output Analysis

1. All the outputs at the project level are relevant to the overall RE/EE/CDM program under the UNDP climate change and sustainable energy portfolio of the UNDP China. Viewed from the UNDP China strategic framework and country development plan in the program cycle 2006 – 2010, the project outputs are all relevant to the sustainable development through renewable energy and energy efficiency of various sectors in China.
2. The outputs of the UNDP/GEF projects mostly are very relevant to the needs Of China and rated Highly Satisfactory in view of the fact that, based on reports and interviews, the physical accomplishments, capacity building and installation of coordination mechanisms were more than expected in the original targets committed and included in the respective project documents
3. The factors that affected the timely delivery of the project outputs on the overall have tended to extend the timelines for the projects. The reasons or situations include the following: uncompleted activities in the local sites as part of local inputs to co-financing commitments, government restructuring, SARS epidemic, remaining reports or documentation, limited staff availability of the PMOs due to the high turnover rates experienced, and inability of the sub-contractors to comply with agreed timetable or their outputs needed some more time to meet expected standards.
4. The goals of UNFCCC and UNDP as expressed in the Country Program Document and the Strategic Results Framework under the climate change and sustainable energy portfolio of UNDP China have been met by the project outputs with Highly Satisfactory ratings.
5. In the design and actual implementation of the projects, the poverty reduction objectives are well taken into consideration. The increased access to energy services and the reduction of operating cost of providing energy have seen results in the improvement of basic services in the household, TVEs, the four industrial sectors, transportation, health, education, communication and livelihood opportunities.
6. The project outputs and activities have clearly advanced the UNDP's role and advocacy to climate change and sustainable energy in the RE/EE/CDM project evaluated. The use of multimedia, information centers, newsletters, publications, radio plugs, local and international conferences and network linkages have greatly helped in portraying UNDP's mandate and achievements in these areas.

Outcome-Output Linkage

1. The agencies of the GoC and the different partners implementing the projects have placed these projects in the core of their sustainable development programs and, in most cases, have used these projects to crystallize concepts that are now the governing sectoral policies, to develop their own capacities, to build the organizational structures, to acquire international best practices and technologies, and more importantly, to mobilize support to leverage into bigger commitments for the whole program in an integrated, results-based approach. The PMOs and government officials interviewed are unanimous in saying that these could not have been possible or these could take much longer time if done single-handedly by the GoC.
2. The results are also very much aligned to the purposes and outcome intended by the UNDP and are all practically within the project timelines and budgetary allocations.
3. The soft assistance or the indirect funding assistance have clearly accelerated the pace of implementation with better grasp of the prevailing situation in terms of increased coordination, better analysis and feasibility studies, resource assessments, educational tours, and capacity building that were not budgeted in the projects. They have

augmented the resources to render more effectively and efficiently the desired outcomes on the program and national levels.

4. As discussed above, there are factors that affected the timely delivery of the individual project outputs towards the collective program output expected by this time in 2008 within the program cycle 2006 – 2010. Adaptive management at the project and program levels has been done in order to ensure that the outcome expected at the end of the cycle are fully met.
5. The UNDP partnership strategy has effectively accomplished its purpose in proving a platform for mutual cooperation and shared benefits that are the main reasons for the unity and purpose and responsibilities of bringing sustainable development, poverty alleviation and climate change measures in China. This partnership has gone a long way in generating the outcome from the multifarious outputs that the climate change and sustainable energy portfolio has been created to accomplish.
6. The UNDP projects, with incremental funds which are in relatively small proportion to the whole requirement, have mobilized a huge leveraged amount of GoC, international and multilateral supports in terms of technical expertise, capacity development, and pilot RE systems which are very necessary to accelerate and expand the commercialization of RE and EE technologies for sustainable development and climate change at the national level. The international posture and credibility of the UNDP approach not only attracted these necessary inputs but also signified the willingness and commitment of the partners to mutually share the costs and benefits of the developmental activities towards common national and global goals.
7. The UNDP initiatives and consensus-based interventions are sustainable and permanent and have clearly been integrated and become core programs in the national sustainable development plans of China. The interventions in policy development, in the passage of requisite laws and regulations, in attracting private-public sector partnership and involvement, in acquiring the best available technologies and practices, in developing local capability, in reducing transaction costs, increasing technical efficiencies and many more, have clearly exhibited high efficiency marks. These are not only because these outcome elements are made as success indicators of the outcome themselves but also because of the results-based M&E that all these projects have adopted as a very good management principle in tracking performance and achieving progress towards the intended outcome in the technologies covered by this Evaluation.

Best Practice and Lessons Learned

1. Direct project financing intervention by UNDP/GEF has gone a long way in helping develop China's energy sector to find the right mechanisms that will suit its long-term development goals and impacts. In the same token, UNDP's indirect financing intervention or soft assistance has likewise accelerated the pace of project implementation, reduced the risks and improved the overall confidence of the stakeholders.
2. Loan financing through capitalization of revolving funds are necessary to attract end users and bankers because they are practical and produce results.
3. Partnerships somehow have also some constraints and limitations also which could come from UNDP's own *raison d'etre* and niche. There could also be different expectations from the public and private partner funders. Because of the nature and purpose of UNDP assistance, UNDP cannot fund direct support to private enterprise investments which are very much needed by RE and EE projects.
4. Capacity building and training of energy practitioners on project development, management and consultancy appear not enough. There is continuing need in creating a sustainable demand and right compensation for their services. Otherwise, there will always be unproductive manpower attrition and could affect project implementation and optimization of project outcomes as experienced by the many projects, PMOs and government agencies.
5. There is lack of knowledge on the overall manpower requirement of the long-term energy goals which appear to be ambitious. There is also unclear linkage between these

requirements with the long-term goals and targets of the educational system and training programs to ensure availability of RE/EE/CDM practitioners when the time comes.

CONCLUSIONS

Resulting from the above analysis, therefore, the following are concluded:

1. All the UNDP projects reviewed in this Outcome Evaluation have proven to be relevant now and in the years to come up to the end of the UNDP China Program Cycle in 2010 and beyond.
2. UNDP's market-based intervention in China, shifting from funding technical demonstrations to UNDP/GEF-supported or -capitalized financial mechanisms, which began in early 2000, has proven to be very effective and has now gained fruition in the country as reaffirmed by this Evaluation.
3. The efficiency of UNDP Projects evaluated in the output-outcome perspectives has been well demonstrated in terms of following the project designs in producing the outputs more than expected outcome in the targets originally set and lowering transaction costs and increased technology performance efficiencies. The UNDP projects are very effective in realizing the outcome, that the relatively small proportion of project funding and soft assistance from UNDP/GEF can be leveraged to meet the entire program requirement, the UNDP projects and partnership strategies are efficiently designed in a more logical and programmatic way making it possible to mobilize support from international and multilateral agencies.
4. UNDP has also pioneered in areas that have been successful and effective in the market transformation for EE and RE projects. It has effectively brokered in mobilizing sources of capital in China for energy efficiency and renewable energy projects is very good and should be continued in the light of great success of such role and responsibility for RE and EE projects in sustainable development.
5. UNDP contributions in the national capacity development of China are very significant, while the "market transformation" approach of UNDP for creating new markets has met many challenges in China, especially with the country's own restructuring and shift to market-based economy happening at the right time.
6. UNDP's capacity building contribution in terms of paving the way to train and make the stakeholders and users become knowledgeable and committed to take on responsibility has been very remarkable and has long and far-reaching impacts to China.
7. UNDP has always successfully brokered for mobilizing various sources of capital from among varied partners as seen in the projects evaluated. The sources include other multilateral/bilateral organizations, development banks, private sector and enterprises, the government, and private banks. The brokered arrangements were not only for pilot demonstration projects like the TVEs, end-use efficiency improvements in manufacturing industries and buildings but also in long-term and outcome-uncertain fields such as fuel cell buses, MDG carbon financing, etc. Continuing the UNDP support toward this direction until the end of the present program cycle to 2010 and in the next cycle will redound to maximizing the long-term benefits that have started to flow through these projects already.
8. Based on the debriefing session, it was observed that with the very satisfactory progress and status of the projects reviewed, the following needs to be given attention also: networking among R&D institutions, posture of China in the programmatic CDM, manpower requirements of the ambitious long-term RE/EE targets, high turnover rates in RE/EE field, and delays in sub-contractor outputs,

RECOMMENDATIONS

It is recommended that UNDP include in its framework of support the following:

1. Continue the development of local capacities and encouraging continuing commitment by supporting relevant institutions sustain the training and capacity building started by the Project and initiate the conduct of a training gap analysis and manpower requirement assessment vis-à-vis the long term energy goals and targets to ensure manpower availability during implementation.
2. Continue further work to support updating and refinements of policy, planning, certification, testing, and monitoring for results to build upon the remarkable progress and accomplishments made during the Project duration through inter-agency committees established by the projects; networking of R&D Centers, academic institutions and pertinent government agencies; round table discussions; and pooling of resources towards common goals.
3. Continue to focus on the national level of impact given the momentum and growth initiated by the Project and the very positive response by the GoC, the private sector and local government units.
4. Continue technology development and delivery and improvement for efficiency, reliability, and modernization the RE technology and financing mechanisms to bring down further the cost of acquisition and operation.
5. Continue to support scaling-up activities and leveraging inputs, considering the results of pilot demonstration on cost, benefit, remaining barriers and challenges and effective dissemination of best practices and lessons learned from the project experiences.
6. Continue to support the realization of the outcome in the remaining part of the Programme Cycle 2006 – 2010 and coming next cycle and the dissemination of outcomes and results of efforts achieved so far to broader range of reach.

For the proposed continuing cooperation and coordination to meet national goals, the Team likewise recommends that UNDP considers to:

1. Continue to identify, develop and support follow-through projects that build upon the highly beneficial gains and outcomes in the projects included in this Outcome Evaluation and in the other related projects through institutionalization of the systems and best practices.
2. Spearhead, coordinate and support a RE/EE/CDM Partners' Caucus or Round Table Discussion that could promote an informed and unified approach in the project initiatives for China's MDGs and establish networking among R&D Centers, academic institutions and pertinent government agencies.
3. Look at how a sustainable demand for energy services can be maintained and at the same time develop attractive financial and institutional structures to address the energy manpower problem.
4. Support China in taking its proper posture in Programmatic CDM (p-CDM) approach in international conventions and national programmes.
5. Support the conduct of a manpower requirement assessment in the RE/EE/CDM fields as implied by the ambitious targets in the long-term energy development goals of China
6. Support the establishment of a quality assurance system covering the entire cycle and value chain for improving effectiveness and efficiency in the project sub-contracting and outsourcing of consultancy services to minimize delays and meet project expectations.

1. INTRODUCTION

1.1. Background and Purpose of the Outcome Evaluation

The United Nations Development Programme (UNDP), being a key international development agency, has increasingly focused not only in producing very good output “deliverables” but also in ultimate outcomes in discernible improvements in the overall national and global situation and the people’s lives through its various program portfolios.

This independent Outcome Evaluation is part of the Evaluation Plan of UNDP China which was adopted in January 2007 for the Country Programme Document (CPD) for the cycle 2006 – 2010. Based on the Terms of Reference (TOR), which is seen as **Annex A**, the **purpose** of this evaluation is:

. . . to provide important information on (i) the contributions that UNDP has made to the outcome, (ii) whether the UNDP strategy has been effective, and (iii) whether some adjustments are needed so that UNDP can stay relevant in the field in future.

The **outcome to be evaluated**, outcome indicators and the reference baseline situation in 2006 as included in the detailed Strategic Results Framework (SRF) for China for 2006 – 2011 is summarized below:

Intended Outcome	UNDAF Goal: Outcome 3 – More efficient management of natural resources and development of environmentally friendly behavior to ensure environmental sustainability
Outcome Indicators	Specific policy, legal, economic and regulatory measures piloted/taken to ensure integration of sustainable energy development objectives into development policies
Baseline (2006)	<ul style="list-style-type: none">• Basic policy exists, sector based workable guidelines needed• Basic technology exists, technology dissemination needed• Limited use of market-based instruments to increase energy efficiency and use of renewable energy• Limited capacities to address energy concerns and climate change

UNDP China has identified the following two key outputs as the major means to contribute to the achievement of Outcome No. 6 on Energy, to be:

- Proposals and recommendations for favorable policies and approaches for renewable energy (RE) development
- Proposals and recommendations for favorable policies and approaches for energy efficiency (EE) development.

The outputs are to be accomplished through a group of UNDP-supported projects and various non-project activities (soft assistance) mainly funded by the Global Environmental Facility (GEF), the Government of China (GoC), bilateral partners, private sector in China, and UNDP through the China Country Office. The outputs are linked to helping China improve its implementation of the United Nations Framework Convention for Climate Change (UNFCCC) commitments and more importantly, derive its own national development benefits and outcomes as well. There are a numerous such projects in China, of which UNDP/GEF-supported projects constitute already a big subset, as implemented in cooperation with the

different project partners that are associated with the above-mentioned outputs and the outcome. Those selected to be included in this Outcome Evaluation focuses only on the following seven (7) UNDP-supported RE and EE projects:

Table 1. Projects included in the UNDP Outcome Evaluation

Official Project Title (Project Code)	Short Title
1. Capacity Building for the Rapid Commercialization of Renewable Energy in China (CPR/97/G31)	RE Commercialization Project
2. China End-Use Energy Efficiency Project (CPR/02/G32)	EUEEP Project
3. Barrier Removal for the Widespread Commercialization of Energy-Efficient CFC-Free Refrigerators in China (CPR/98/G31)	Efficient Refrigerators Project
4. Energy Conservation and GHG Emissions Reduction in Chinese Township and Village Enterprises (TVE) – Phase II (CPR/99/G31)	TVE – Phase II Project
5. Building Capacity for the Clean Development Mechanism (CDM) in China (CPR/01/002 (CPR/02/H02)	CDM Capacity Building Project
6. China Millennium Development Goals (MDG) Carbon Finance (CPR/06/305)	Carbon Finance Project
7. Demonstration for Fuel-Cell Bus Commercialization in China – Phase II (CPR/07/G36)	FCB – II Project

The attributes and observations on these projects relevant to the intended outcome and purpose of this evaluation are presented in Chapter 3. It is not the purpose of this outcome evaluation to evaluate these seven (7) RE and EE and related CDM projects, but rather assess how each project has been contributing, individually and collectively, to the achievement of the intended outcome.

1.2. Methodology and Approach of Evaluation

While the intended outcome has been simply stated as “improvement on the use of RE and EE technologies”, there are many program components and elements involved which are in one way or another provided by each of the above projects towards the said outcome. The approach and methodology of evaluation therefore has to view each project as following a programmatic and integrated multi-year developmental process not only from the viewpoint of the UNDP Country Program for China but also on the overall China national context.

An understanding of the technology and market development process for RE and EE technologies in support of national sustainable development goals will also be an underlying guiding logical framework of approach. As such, the results framework for each project as they were designed and actually implemented will have to be reviewed so as to put the specific project goals and outputs in perspective with the overall intended outcome in terms of coherence and timeframe aspects.

It is assumed at the outset of evaluation that every project was designed for specific purpose and may happen to include some, but not all, of the components and elements of the intended outcome. This evaluation attempted to look at how each of the projects has contributed to the different elements of the intended outcome.

This outcome evaluation has followed the requirements of the TOR contained in **Annex A**, and the standard UNDP Guidelines for Outcome Evaluation. The process for data collection and analysis included the following:

- a. desk review of existing documents and materials (list shown in **Annex B**).
- b. interviews with partners and stakeholders (list of persons interviewed and consulted in **Annex C** including what the partners have achieved with regard to the outcome and what strategies they have used)
- c. validation of accomplishment of project field sites (because of limited time, the evaluation team relied on project reports and interviews about the project sites to verify the UNDP-supported outputs and in relation to the impacts towards the outcome) **Annex D** shows the Program of Activities conducted by the Evaluation Team among the PMOs of the different projects. A presentation of the individual output-outcome links in terms of project goal, purpose and outcomes is shown project performance matrices in **Annex E**.
- d. briefing and debriefing sessions with UNDP and the participating government agencies/partners.

For its scope, this outcome evaluation focused on the following analyses to come up with the conclusions, recommendations and lessons learned expected from the evaluation: outcome analysis, output analysis and output-outcome analysis. An evaluation guide questionnaire was developed as a tool and checklist of issues and information to be derived from the interview and submission of project reports.

At the end of the evaluation mission, a draft outcome evaluation report was submitted for comments and finalization which forms the main product deliverable from the evaluation task. In closing, the draft report was presented and reviewed for comments and suggestions in a debriefing session with UNDP China as basis for finalization of the **Report**.

2. ENERGY AND CLIMATE CHANGE IN THE CHINA NATIONAL CONTEXT

2.1. Challenges and Opportunities in Energy and Climate Change

The phenomenal economic growth and the world's largest national population of China and its extensive dependence on coal and petroleum have led to many critical and massive environmental effects. Due to its CO₂ intensive energy production due to coal, China will become the world's biggest CO₂ emitter before 2010, thus overtaking the U.S.A. for that matter. The different projects in renewable energy, energy efficiency and clean development mechanisms have helped China to expand its industrial and commercial infrastructures to include clean and sustainable renewable energy and energy efficiency technologies and comply with global climate change commitments.

China is in a transition process towards a market-oriented economy, and continues to be confronted with significant development issues and difficulties both at the central and local levels. These difficulties relevant to this evaluation are, among others, low energy efficiency, serious environmental pollution, high level of unemployment, etc. Thus, there is strong necessity to promote sustainable development principles at all levels in order to achieve a balanced and sustainable economic growth.

Introducing new and renewable energy and improving energy efficiency in industry, transportation, construction and other areas will have to play very important roles in this process but commercializing these technologies have many challenges and also have many opportunities as well.

On the challenges, for renewable energy, until the late 90's, development of renewable energy technologies (RETs) focused largely on research and pilot demonstration in China. Consequently, the market for renewable energy sources was poorly developed, and renewable energy yet financially viable. Additionally, RET costs were high due to limited

production and lack of economies of scale. In the absence of a critical minimum demand, investors are hesitant to invest in manufacturing or operating renewable energy systems. Because of the limited number of units produced, the prices of small-scale technology such as PV, biogas etc. systems were too high, when available, and consumers were unwilling or unable to pay. Finally, for those RETs such as solar water heaters (SWH), which were viable and widely used hundreds of small companies in this market sector were manufacturing systems of variable quality, and eroding consumer confidence, especially for exports.

In recent years, with the modern development of RETs, the technologies have become mature enough to be applied commercially either in developed countries or developing countries. Most bottlenecks trace the root cause to many reasons related to financing, institutional, awareness, perception and planning that involve the Government, industries and public. Situation analyses conducted to understand the barriers to the widespread commercialization of RETs include: limited scale of existing investments, lack of familiarity with successful market-oriented efforts to commercialize the technologies, lack of awareness of investment opportunities, high up-front costs and lack of access to credit, incomplete assessment of renewable resources, high transaction costs, lack of standards and testing facilities for equipment and poor linkages from R&D to commercialization. These appear manageable and therefore became the focus of the RE projects in China.

For the challenges in energy efficiency (EE), the improvement of energy efficiency in the industries, enterprises and buildings is difficult because of the traditional ways of energy usage and the technologies are capital-intensive. It is a tall order for China to reach production competitiveness and bring the energy efficiency performance to match internationally attained standards.

The opportunities, on the other hand, are great for RE and EE to support sustainable development in China. From a broader view, China is facing the pressure from international society on greenhouse gases reduction. More applications of renewable energy and improving the energy efficiency are among the most important instruments to realize the GHG reduction target.

China has one of the best renewable energy resource endowments in the world. National wind resource potential exceeds 1,000 gigawatts (GW). Solar insolation is excellent, with 1,700 billion Mtce of solar energy absorbed at the surface annually. Hydro, biomass, and geothermal resources are also abundant in some provinces, with potential annual resources of 300 million Mtce of biomass for energy purposes, 76 GW for mini-hydro (capacities less than 25 MW), and 6.7 GW from geothermal energy.

China has most of the greatest potential for CDM opportunities and already account for 50% of all CERs issued worldwide. The challenges mentioned have become opportunities in terms of CDM and the magnitude of energy savings. The opening of programmatic CDM (pCDM) provides more windows for RE and EE in terms of policy-based and sector-wide programs involving small users that are characteristic of most RE and EE users. China has made impressive gains in its share in the worldwide CDM market, and also made significant progress in the rankings of CDM host countries.

2.2. Relevant Energy and Climate Change Policies

Within the immediate past period relevant to the evaluation, it is noted that as early as 2003, China has commenced active policy on RETs when it introduced RE in the legislations and end-use efficiency projects with the European Union-assisted project on End Use Energy and Environment Program. In chronological order, the developments that follow as mentioned below on either RE or EE reflect the determination of the GoC to put the two energy sub-sectors in the priority of government development policies.

In November 2004, the Medium and Long-term Energy Conservation Plan was published by the GoC. In 2005, China's 11th Five Year Plan placed an ambitious 2010 goal of reducing energy use intensity by 20% per unit of Gross Domestic Product (GDP) from 2005 levels. One of the key initiatives for realizing this energy goal is the Top-1000 Energy-Consuming Enterprises Program (or the Top-1000 Program) which has set energy-saving targets for China's 1000 highest energy-consuming enterprises. The Top-1000 Program and implementation plan were launched in April 2006 by the National Development and Reform Commission (NDRC), which is China's macroeconomic management agency under the State Council. The implementation plan provided guidance to the enterprises, calling on them to significantly improve their energy efficiency with the goal of making domestic production competitive and matching international efficiency standards.

The 11th Five year Plan also aimed at increasing the share of renewable energy in China's energy mix to 15% by 2020. In January 2006, the Renewable Energy Law was passed and identified the significance of RET in terms of augmenting the energy supply, improving the energy supply structure, ensuring energy security especially in remote areas, protecting the environment and achieving sustainable development.

In the past, the GoC has adopted a number of policies to promote the improvement of energy efficiency. To achieve a sustainable future, it has attached great importance on energy security and climate change. In June 2007, China established a Lead Group on Climate Change, Energy Saving and Emission Reductions with Premier Wen Jiabao as the chairperson and embarked on the National Climate Change Program. In December 2007, China also published a white paper on China's Energy Conditions and Policies, which also emphasized the importance of making the right choices such as developing renewable and promoting energy efficiency to achieve sustainable development. There are also many other efforts to improve energy efficiency in China, such as the Ten Key Energy Conservation Projects, etc. All these efforts have helped to improve the energy efficiency performance in China.

The Medium and Long-Term Plan of China has put forward the RE targets, taking advantage of those mature RE technologies, such as hydropower, biogas, solar heat and geothermal and propel the industrialization process of wind, biomass generation, and solar power. Eventually, there is great optimism in the national aim of 10% by 2010 and 15% by 2020 for RE in the entire energy mix.

China ratified the Kyoto Protocol on August 30, 2002, issued its Interim Measures for Management and Operation of CDM Projects in China on June 30, 2004, and renewed these on October 12, 2005, which set up the regulations for CDM project developers to follow.

The passage of these laws and policies are extremely important steps in energy conservation and new and renewable energy technologies in China. However, these laws are usually very general and should be accompanied with implementing rules, regulations, standards and guidelines to attain the intents of the laws through technology demonstrations and finally, commercial applications.

2.3. Partners in Energy and Climate Change in UNDP/GEF-Supported Projects

The GoC has many local and international partners/donors supporting various RE and EE projects. For the seven (7) RE and EE projects evaluated, this section discusses on the partners directly supporting these projects and later in the section, the other organizations that are also helping the GoC through other non-UNDP-GEF projects.

From the national side, the government agencies which are also partners in the seven (7) energy projects are also implement partners of the UNDP/GEF projects. These include the National Development and Reform Commission (NDRC), the Ministry of Agriculture (MOA),

Ministry of Environmental Protection (MEP) and the Ministry of Science and Technology (MOST).

Private companies and enterprises also provide partner's vital resource inputs and project piloting and implementing capability. The electric utilities are also partners in some projects.

On the international side, the partners in RE, EE and CDM come from the international/multilateral organizations and bilateral assistance programs. These include: the Global Environmental Facility (GEF) and bilateral arrangements with the Governments of Netherlands, Australia, Norway and Italy.

Other organizations and agencies outside the UNDP/GEF-initiated partnerships that are also supporting the RE, EE and climate change programs of GoC include the following: the World Bank, the European Union, WWF, Asian Development Bank, New Energy and Industrial Technology Development Organization (NEDO), the Energy Foundation USA. This Evaluation does not cover the outcomes resulting from their contributions, while it is highly recognized that they do, too, contribute in multi-fold ways to the progressive status of RE, EE and CDM in China.

On CDM, the high uncertainties and complicated international rules connected to the CDM will likely continue to make financing CDM projects experiencing some barriers. Still, there are several types of channels now available to finance CDM projects such as the China Development Bank (CDB), World Bank, Asian Development Bank (ADB), International Finance Corporation and some commercial banks. The services they offer vary such as loan, equity or guarantees. UNDP's developmental support (with assistance from the GEF) focuses on capacity building, demonstration and replication strategies for new technologies and CDM, seed money for introducing new and innovative market-based financial mechanisms, and development of information and exchanges systems.

2.4. UNDP Role in Energy and Climate Change Program in China

UNDP is the UN's global development network, advocating for change and connecting countries to knowledge, experience and resources to help people build a better life. UNDP has been working with many countries on their own solutions to global and national development challenges. As UNDP develops local capacity, it draws on stakeholders and a wide range of partners through a partnership arrangement based on mutual benefits and cooperation.

In China and in other countries, UNDP fosters human development to empower women and men to build better lives and sustainable communities. As the UN's development network, UNDP draws on a world of experience to assist China in developing its own solutions to the country's development challenges. Through partnerships and innovation, UNDP works to achieve the Millennium Development Goals and an equitable Xiao Kang society by reducing poverty, strengthening rule of the law, promoting energy security and environmental sustainability, and other social concerns.

UNDP's support on energy efficiency in China focuses on the following areas: development and modeling voluntary agreements, energy efficiency design codes for new and existing facilities and equipment, energy efficiency standards for industrial, residential and services equipment, energy management information system and reporting programme (EMISRP) for key energy-intensive enterprises, data collection on building energy use, development of policies and standards for building energy performance, standards implementation and incentives to exceed the standards, energy efficiency information dissemination, technology development, the revision of Energy Conservation Law, energy efficiency financing options, studies on the targets (20% reduction of energy intensity) stipulated in the 11th Five Year Programme, and strengthening the energy conservation centers, etc.

The implementation of the CDM in China, however, will require the development of sufficient capacity to deal with the financial, technical, and legal issues that are associated with CDM projects. To address the problems, the Government of China has worked with United Nations Foundation (UNF), the United Nations Development Programme (UNDP), the Norwegian Agency for Development Cooperation (NORAD) and the Italian Ministry for Environment and Territory.

3. RELEVANT ATTRIBUTES AND OBSERVATIONS IN THE PROJECTS INCLUDED IN THE OUTCOME EVALUATION

3.1. Overview

In this chapter, the various projects included in this evaluation on RE, EE and Clean Development Mechanisms (CDM) to support the market-based development of the said projects are described in terms of relevant attributes and observation vis-à-vis the outcome. As an overview of these projects, Table 1 below provides the basic information.

The project profiles include the major outputs in relation to the UNDP outcome, problems encountered, and lessons learned which are the bases of the program level output-outcome link analysis.

The details of the projects can also be seen in **Annex E** where an assessment of the project level outcomes can be deduced.

Table 2. China RE and EE Projects Included in the Outcome Evaluation, as Supported by UNDP/GEF and other Partners

No.	Project Short Title and Code	Sub-sector	Funding Partners	Total Project Funds based on the ProDoc (in million US\$)	UNDP Share in Total Project Funds* (in %)	Project Duration (in yrs)		Executing Agency	Govt Agency Implementor
						As Designed	Actual		
1	RE Commercialization Project (CPR/97/G31)	Renewable Energy	UNDP/GEF Australia Netherlands <u>GoC</u> Total	8.80 3.00 2.53 11.5 25.83	34.0	5 (1999-2003)	7.8 (05.1999 – 03.2007) Completed	UNDESA	NDRC
2	EUEEP Project (CPR/02/G32)	Energy Efficiency	UNDP/GEF GoC <u>Priv. Cos.</u> Total	17.00 31.35 32.00 80.37	21.1	3 (2005-2007)	4.5 (06.2005 – 12.2009) Ongoing	Nationally Executed	NDRC
3	Efficient Refrigerators Project (CPR/98/G31)	Energy Efficiency	UNDP/GEF GoC <u>Priv. Cos.</u> Total	9.62 1.37 29.72 40.91	23.5	5 1999-2004	9 12.1999 – 12.2008 Ongoing	Nationally Executed	MOE
4	TVE – Phase II Project (CPR/99/G31)	Energy efficiency	UNDP/GEF GoC Agri. Bank Ch <u>Priv. Enter.</u> Total	7.99 2.50 2.00 6.05 18.54	43.1	4 (2001-2005)	6.4 (02.2001 – 07.2007) Completed	UNIDO	MOA
5	CDM Capacity Building Project (CPR/01/002; CPR/02/H02)	Sustainable Energy Climate Change	UNDP TTF UN Foundation <u>Norway</u> Total	0.05 0.40 0.73 1.18	33.0	5 (2003-2007)	5 (2003-2007) Completed	Nationally Executed	NDRC
6	Carbon Finance Project (CPR/06/305)	Sustainable Energy/ Climate Change	UNDP TTF <u>Third Party</u> Total	0.20 1.50 1.70	11.8	3 (2006-2009)	3.8 (02.2007 – 12.2009) Ongoing	Nationally Executed	MOST
7	FCB – II Project (CPR/07/G36)	Sustainable Energy/ Climate Change	UNDP/GEF MOST Beijing City Shanghai City <u>Others</u> Total	5.96 3.52 3.54 4.38 1.22 18.63	31.9	4 (2006-2010)	4 (2007 – 2011) Ongoing	Nationally Executed	MOST
Totals				187.16	26.7				

* In addition to project inputs, UNDP also provides various forms of soft assistance.

3.2. Common Observations

Based on the project descriptions and attributes, the following are common observations:

- a. Of the seven (7) projects included in this Outcome Evaluation, three projects were already completed, viz. RE Commercialization Project, TVE – Phase II Project and CDM Capacity Building Project. The remaining four projects are in the final years or at the stage of project completion.
- b. The projects are all multi-partnership in composition, in interest and in funding support and hence, each project is designed to have a partnership strategy in order to achieve common goals and outcome for China.
- c. The results and lessons learned from cooperative undertaking will benefit not only China but also other countries
- d. UNDP takes the lead in initiating project development and strategy, in providing the coordinating mechanism among partners, in monitoring/evaluating for results, and in providing soft assistance to the Government of China to hasten the pace and bridge the gaps in the implementation of the activities towards the intended outcome.
- e. The local inputs by the Government of China and other domestic inputs come in the form of (a) in-kind contributions from GoC (personnel, staff support, training facilities, PMO accommodation, incidental transport and logistics) and (b) equipment funding by beneficiary enterprises for pilot installations by cash or loaned investments.
- f. As a strong indication of ownership and commitment to the development program, the GoC has placed significant share in the overall project costs and also committed to supplement any shortfall in financing should the funds identified would not be realized completely as a risk aversion measure.
- g. UNDP/GEF covers the remaining costs associated with obtaining the technology, in line with incremental costing scheme adopted for all UNDP/GEF-assisted projects. For the seven (7) projects, on the average, the UNDP inputs represent about 26.7% of the overall total project exposure by all the donors/partners.
- h. In order to ensure achievement of the outputs and outcome of the projects, UNDP has installed adequate result-based monitoring and evaluation systems and risk-based management approach in the seven (7) projects as evidenced by the presence of formal organizational structures and availability of periodic Annual Project Reports/Project Implementation Reviews (APR/PIRs), evaluations, and standard audits. The projects are operationalized on a day-to-day basis by the respective Project Management Offices (PMOs) in close coordination with implementing government agency. On the policy, implementation and coordination mechanisms, the projects are overseen by tripartite reviews, multi-agency/partner steering committees, advisory groups and stakeholder consultations which such management arrangements are worded with clarity in the respective Project Documents.
- i. There are unanimous remarks from the PMOs, project staff and consultants that the UNDP/GEF projects evaluated were efficiently designed with clear logical frameworks. Most of the people involved in the project implementation were in one way or another involved also during the project development stage which consisted of extensive consultations among the partners and target beneficiaries. Particularly for the completed or almost completed projects, the PMOs shared that the project documents are reflective of clear understanding of the purpose, problem situation, strategies, approaches, roles and timeframes of results which have helped them to effectively implement the project and to unify the organizations involved. The evaluators observed and affirm these highly positive remarks by reading all the project documents, by the records and documentation of the proceedings, results and outputs of the activities and by the results shared through other detailed project evaluations done previously for the different projects.
- j. The project timelines were exceeded from the original duration in the PRODOC in some projects (and the estimated variance), and for instance, the more significant ones are in the RE Commercialization Project (2.8 yrs), the Efficient Refrigerators Project (4 yrs) and the TVE - Phase II Project (2.4 yrs). The reasons or situations happening during the project duration cited in common include the following: (a) uncompleted activities in the

local sites as part of local inputs to co-financing commitments, (b) government restructuring, (c) SARS epidemic, (d) remaining reports or documentation, and (e) limited staff availability of the PMOs due to the high turnover rates experienced, and (f) inability of the sub-contractors to comply with agreed timetable or their outputs needed some more time to meet expected standards.

3.3. UNDP Soft Assistance Contribution

There is a number of soft assistance or also called indirect financing contribution that UNDP has placed in the RE, EE and CDM projects in China in terms of non-project activities and inputs such as policy expert advice, dialogue, consultations, advocacy, brokerage/coordination services, etc which are also important inputs to the achievement of the UNDP outcome. These were delivered through program portfolios, policy advisors, sub-regional resource facility system, country office presence and ad hoc stakeholder workshops and consultations.

The UNDP inputs in terms of soft assistance are also provided by UNDP as seen necessary to respond to the related needs of the program portfolios for GoC. They appear as common activities and serve the program requirements, such as: focused studies, additional pilot demonstration, legislation and policy support, additional training and conferences for capacity building, resource assessment, business development and commercialization support, and promotion and information dissemination. These soft assistance inputs are sourced by UNDP China from different sources and are observed to be of strategic importance because of prevailing and/or changing program circumstances but were not anticipated in the design and budgeting of the projects.

3.4. Specific Relevant Project Attributes in Relation to Outcome

The following section describes the specific attributes of the different projects in terms of project information and the UNDP contributions in achieving the outcome

3.4.1. **RE Commercialization Project (CPR/97/G31)**

This Project has helped China to expand its commercial and industrial capability and capacity to mobilize clean and sustainable renewable energy resources including biomass waste from agro-industrial facilities, wind and solar.

The purpose of this project is to promote the widespread adoption of RETs in China by removing a range of barriers to increased market penetration of the technologies. It aims to strengthen the capacity of china to shift from supply-oriented technology deployment to demand-driven investor- and consumer-friendly approaches. The Project aims to develop market-based institutions and instruments to attract new players in the RE industry and increase investments in RETs. To provide first-hand knowledge of a particular instrument/instrument and demonstrate its validity to increase market penetration, the Project provides support to five pilot projects: rural electrification by solar and wind hybrids, wind farm development, biogas production, bagasse cogeneration and solar water heaters. The selection of the technologies was made on the basis of recent assessments of market conditions and potential for future GHG reductions. The project has been carefully designed to support and complement ongoing and planned projects of UNDP, the World Bank and bilateral aid agencies.

The PMO approached these objectives, among others, through capacity building for key public and private organizations, facilitation of and support for new policy initiatives, development of new solar water heating standards, and through technical and co-financing support for high-value commercial pilot projects. There are seven (7) sub-projects with their specific objectives and approach taken which are included

in the RE Commercialization Project, viz.: (1) wind recourse assessment, (2) hybrid Village power development, (3) industrial-scale biogas development, (4) solar water heater development, (5) bagasse co-generation, (6) institutional development, policy and planning support.

The overall strategy of the project is to strengthen the capacity of China to shift from supply-oriented, state-supported technology deployment to demand-driven, investor-consumer-friendly approaches to increase investment in RETs. In order to further support the market-oriented approach, the GoC has taken steps to streamline the role of government and strengthen coordination amongst government agencies. Among the specific strategies adopted by the project include: decreasing the risks in investments, establish pilot demonstration projects in order to have hands-on experience and basis for policies, build on and complement the UNDP RE program in China in coordination with other partners, strengthen capacity of stakeholders and end-users, and information dissemination.

The total budget of the project is 25.8 million USD, including GEF: 8.8 million USD, Government of Australia and Netherlands, 5.5 million USD, and the GoC, 11.5 million USD.

The Project was designed in 1999 through assistance by UNDP/GEF Project Development Facility and GoC. It was supposed to be a five year project but was eventually extended to become almost eight years of implementation.

The project was executed by UNDESA with the responsibility for technical and financial reporting to GEF through the UNDP China Office. It has been implemented by the NDRC (formerly under the name of SETC) and assisted by the Project Management Office (PMO) created from the project resources. The project was co-implemented by the State Environment Protection Agency (SEPA).

Because of China's size, the scale of assistance required to move towards full commercialization of RE is also large. While this project is expected to remove many of the identified barriers, it cannot remove them all. Some barriers will surface as the recognized barriers are being removed, therefore, the challenge continues and therefore needs more investment and technical assistance. A great deal of policy development, coordination among agencies, information exchange and promotion are required.

- *Major Project Outputs*

The Project had its Final Evaluation in December 2007 in detail which was used as basis for recognizing the main outputs and outcomes of the project. Accordingly, the Project has followed the plan of the original Project Document with some agreed modifications because of emerging market and economic changes happening in all other sectors in China. The Project has helped to create, train, and mobilize a burgeoning industry of renewable energy companies, to directly leverage major government programs and policies, and to demonstrate new market-oriented approaches in project development and implementation of six pilot projects. The Project has strengthened local capacity in the transition from supply-driven to demand-driven technology deployment. In addition, the Project has provided the GOC, project developers, and technology suppliers with first-hand knowledge of market-based approaches through pilot projects in village power hybrid systems, industrial-scale biogas, and bagasse co-generation. For wind electric power and solar water heating (SWH), the Project has established standards for measurement and testing and in SWH has established a certification process. The Project has impacted national policy in the biogas, wind, and village power sectors and made a significant contribution to the development of the Renewable Energy Law.

The project's major outputs include:

- a. The UNDP has provided through the project the strategic input and support for the passage of the RE Law which provided legal basis for policy guidelines and market-based instruments in order to create a conducive business environment and investments for the rapid commercialization of RETs in China. This is particularly important in strengthening China's capacity and foundations as it transitions to market demand-driven technology diffusion from a technology supply-oriented practice in government programs. The policy has created long-term impacts for biogas, wind, solar and village-based electrification using RETs.
- b. The establishment of pilot projects has provided the GoC, project developers, technology suppliers and the end-consumers first-hand knowledge and appreciation of the benefits of RETs and the market-oriented business approaches. This preparedness and confidence building have accelerated the technology commercialization of large-scale biogas systems, bagasse cogeneration, village hybrid power systems for rural application, and wind power systems to place China among the top RE power producers in the world. The creation of the China Renewable Energy Industry Association (CREIA) has also been instrumental in the active participation of the private enterprises in the pilot projects and market development for RETs.
- c. The alternate and innovative financing mechanisms developed by the Project as suitable as possible to the unique benefit-generation characteristics of RETs provided the key solutions to the financial barriers identified as deterrent to rapid commercialization. The Project has used integrated approach in various activities which has transformed the perception of technical people, industry players, policy makers, and end-users into understanding and appreciating these mechanisms to their favor. For instance, end-users that formerly treated biogas as an additional environmental cost of doing business now believe that biogas generation and conversion to power as financially attractive and has great potential for power generation and fertilizer bonus and waste water clean up. The efforts have paved the way towards a wind concession or contacting program.
- d. The Project assessed the needs and capacities for credit for small energy users and came up with innovative means to help them acquire the RE devices.
- e. Awareness of RE investment opportunities is the gateway for actual investment decisions. Such opportunities were packaged well to be understandable and implementable like the Biogas National Action Plan and Wind concession Program.
- f. The UNDP support in combined hardware and training support for national RE assessment, beginning with wind resource, for instance, have introduced modern assessment technology and standards development towards establishing a national wind assessment program, wind micro-site characterization methodology and wind concessions contracting program..
- g. Because of local equipment production and the increased volume of market, the Project resulted to relatively lowered transaction costs. The Project and the GoC support somehow absorbed some of these transaction costs in order to catalyze the market for RETs.
- h. RE standards development system was established through a stakeholder participative process and capacity building and the influx of international experience sharing with UNDP support and were adopted and integrated to the national standards program, testing and certification using the SWH standard development process as the key for other RETs to follow. The process was facilitated by the project resulting to seven new SWH standards, testing protocols, industry consensus, capacity building, testing centers, certification systems, product quality labeling and increased awareness on all parties concerned.
- i. The Project provided support to activities that improvement on R&D-to-market linkages with participation of universities, academic and research institutions.

- *Observations and findings*

This UNDP Outcome Evaluation did not review anymore the detailed accomplishments of the project but rather concentrated its analysis on how the outputs have contributed to the attainment of the UNDP outcome in this project.

Contributions of the Project Outputs to UNDP Outcome

Based on the reported accomplishments of the Project and affirmed by the Project Final Evaluation, this Outcome Evaluation observed the following in relation to UNDP intended outcome of improvement in RET application:

- a. The Project has clearly paved the way to the rapid and massive commercialization and business development with very significant success in the following RETs as included in the project scope within the project duration - - wind energy, solar water heating, large-scale biogas systems and bagasse cogeneration. The power grid-connected wind farms reached 283 MW in four sites by end of 2005. By 2006, China's cumulative installed capacity of solar water heaters is around 90 million m², for 80% of the world's total, large-scale biogas systems. By 2005, the total installed capacity of biogas power generation was 2000MW. By 2005, the total installed capacity of bagasse cogeneration is 1700 MW. The GoC has acknowledged that the Project was implemented during the right period of accelerated economic and market growth and attention given by GoC on energy concerns in the light of right concepts and structures.
- b. In terms of GHG reductions estimated in CO₂ equivalent, the following have been reported estimated based on the capacities reported above. Electricity generated from wind energy directly offsets equivalent coal and other carbon-based power at 0.4 million tons of CO₂. Several wind power projects were approved for CDM credits. Solar water heating offsets the power and direct heat from petroleum fuels to significant levels varying from the utilization range describe above at 3.9 to 7.8 million tons CO₂ equivalent of emission avoidance per annum during the last three years of project operation.
- c. Through the RE policies, continuing capacity building, technology improvement and standardization, institutional strengthening, financial mechanisms, market incentives and increased market demand through information and promotions, the Project has undoubtedly laid the good fundamentals and foundations that will help the RE industry continue to achieve larger and sustained market entry that could not have been possible or would take longer periods to achieve without the UNDP intervention through the Project.
- d. The Project accomplishments have provided the impact and outcome to the RE industry not only for China but also for other countries and the global campaign in climate change and sustainable development of UNDP as a whole. Information on best practices and lessons learned China RETs can be shared through international information exchange through UNDP facilitation and between the countries' own initiatives. The favorable acceptance of renewable energy and its GHG impact at all levels in China provides significant influence to the global community particularly to developing countries which are struggling with high imported energy costs but have RE resource endowments to use to similar tremendous advantage and opportunity.
- e. The Project has clearly demonstrated that with market-based approaches and government determination in terms of policies and operational requirements, rapid and massive commercialization of RETs is achievable and redounds to greater, long-term benefits. The national endeavor becomes a strong rallying

- point in addressing pressing issues and motivating public-private partnerships that could also be made possible for other sectors of the economy.
- f. The booming market for RETs in China was catalyzed through the Project by the strong leadership and vision of the GoC through NRDC (formerly SETC) and influx of budgetary resource supports in a situation and period of critical transformation in technology deployment paradigms to demand-oriented mechanisms. This was made possible via a developmental intervention by UNDP which is known and respected by GoC authorities as an agency producing results in appropriate means through very active and purposeful cooperation and involvement by all the partners. The RET development in China has indeed become a track record of growth.
 - g. Credit should also be cited in the Project design and implementation arrangements initiated by UNDP during the project development stage in 1999 which envisioned the RE industry development architecture in China borne out of active stakeholder consultation, logical framework analysis, incremental project costing and mobilization of resources through co-financing approach. The whole development process has undoubtedly encouraged identification and commitment to roles in and ownership of the lessons and benefits by all the stakeholders as beneficially derived from the project experience.

Sustainability of Impacts/Results during and after the Project

The outsourcing by the GoC and implementing agencies of the project management and implementation through the private sector has proven to be instructional as well as developmental in building capacities of the private sector and civil society as they are being prepared to assume own responsibilities during and after the project. The GoC retains the oversight, regulation and monitoring of the RET program as a sustainable development agenda consisting of natural market growth, active private sector participation and sustainability supports from GoC.

Attaining sustainability is an evolving, long-term process for RE technology application and commercialization in widely varying nature, size and type of equipments and systems that are specially aimed at reaching also small-scale, remote areas involving population and businesses that have limited resources. The Project has produced lasting legal policies and guidelines, new market-based business approaches, technology standards and testing, high quality resource data and ready availability, strengthened institutional infrastructures, definition of private sector role, financing mechanisms, monitoring for results, a well-established positive co-operative attitude in facing implementation difficulties, technology capacity, village energy models and knowledge management support that will altogether ensure sustainability in the long haul for the RE industry in China.

GoC looks forward to developing ten (10) wind energy farm sites as they are now included in NDRC's priority list of large-scale wind energy development at the national and provincial levels in the years to come with high quality wind data, well established assessment protocols and highly organized development policies and regulation under the RE Law. UNDP also supported wind resource assessments in four sites that led to the 283 MW wind capacity by end of 2005.

Problems Encountered

The Project was not without problems. These implementation-related problems included the following: a.) unavailability of local manpower, b.) government and power sector restructuring, c.) local level coordination and political issues, d.)

equipment breakage due to natural hazards due to inclement weather conditions, e.) slow equipment supply and service contract procurement process sometimes reaching to one year due to bidding and finding the right selection, and f.) high turn over rates of PMO and implementing agency staff, and the onslaught of SARS.

Lessons Learned

- a. Since the RE projects are usually based in the provinces, the importance of establishing local technical and management capacity to develop and implement the projects have been realized. At the same time, dependence on and difficulty of procuring foreign expertise can be minimized. This has led to strengthening further international cooperation through the valuable assistance of UNDP and cooperating partners. A practical balance between local capability development and employment of foreign expertise has to be strike out in order not to compromise timetable and commitments and encourage systematic technology transfer schemes.
- b. The contracting process needs to be streamlined; the list of qualified candidates needs to be prepared before hand and the number increased to facilitate the selection process. International networking with industry players and other UNDP country offices and partners are expected to produce positive results.
- c. In view of the continuing restructuring of the electric power industry, the project should have the flexibility and collective decision making capability in adapting to changing situations and directional changes so as not to disrupt significantly the timing commitments.
- d. The PMO is a necessary success factor and important strategy while developing institutional capability during the project implementation so that the timetable and quality of outputs are not compromised and so that gaps and unforeseen issues are readily addressed and adaptively managed. With the usual lean PMO staffing budgeted in UNDP projects, resourcefulness of the PMO in augmenting its ability to do work through the private industry association, committees, NGOs and civil society groups has proven to save the project of unnecessary delays and non-performance of activities.

3.4.2. EUEEP Project (CPR/02/G32)

The EUEEP Project is designed in support of the first phase of a 4-phase, 12-year strategic plan developed by the Chinese government to dramatically improve the efficiency of its major end-use sectors, buildings and industry. The Project fosters a strategic approach to developing, implementing and enforcing a comprehensive and effective energy conservation policy and regulatory system consistent with the Energy conservation law of 1998. The Project has three main components: the industry component, the buildings component and the cross-cutting activities component.

The project's purpose is the removal of barriers to the widespread application and practice of energy conservation and energy efficiency in the major energy consuming sectors (buildings and industrial) in China. This will be achieved through partnerships with donors in assisting China establish a sustainable and market-based energy efficiency focus, which will lead to improved economic productivity, reduced greenhouse gas emissions and an improved global environment. Success in implementing such partnerships will strengthen China's capabilities to aggressively pursue energy efficiency as it makes the transition from a centrally planned economy to a market-based economic system.

The project fosters a strategic approach to developing, implementing and enforcing a comprehensive and effective energy conservation policy and regulatory system consistent with the objectives of the Energy Conservation Laws of China.

The GEF grant is US\$17 million. The co-financing is US\$63 million. The total project cost is US\$ 80 million.

Project design was initiated by UNDP through its Project Development Facility (PDF) in 2000 and was finalized in 2004. The date of entry into work programme is June 6, 2005.

UNDP manages the fund, supervise and evaluate the progress of the project. The Ministry of Finance represents GoC and plays a coordinating, supervision and evaluation role. NDRC serves the project Executive Agency. A project coordinating and guiding committee has been established. The National Project Director and National Project Manager were nominated by NDRC. A Project Management Office was established and was responsible for the organizing and implementing of projects.

At the beginning, the energy per unit GDP of industries in China was 3.1 times the international average, 9 times compared to Japan and about 4.3 times OECD countries. Buildings in Beijing used to consume 3 times that for European buildings in the same latitude. The improvement of energy efficiency from what it seems already acceptable is difficult if the industry and individual companies do not know what could be possible. On one hand, availability and adoptability of new and more energy efficient technologies in different sectors may not be readily present in view of policy, technical and financing barriers. In order to push the private sector to adopt such technologies, policy incentives, financial mechanism, labels, standards and other measures need to be made. On the other hand, training, capacity building, information and promotion need to be made to encourage private sector and the public to improve their performances in energy utilization. The primary challenge is to reduce energy consumption and greenhouse gas emissions by significant proportions with reasonable returns on investment. The UNDP has initiated way back during the previous program cycle a national consultation and project development of what is now the EUEE Project and has continued to provide project inputs and soft assistance for this program cycle 2006 - 2010 to continue meet these challenges with the cooperation of various partners not only to address problem situation for China but also serve as model of development for other countries.

- *Major Project Outputs*

The Evaluation Team interviewed and consulted with the EUEEP PMO and NDRC officials and discussed the different EUEEP activities and achievements of the EUEEP.

- a. Removal of barriers to effective application and practice of energy efficiency in the industry and residential sectors

As planned from the PRODOC, the following were produced by the project: the energy efficiency design code for the cement plant was issued. A draft Energy Efficiency Benchmarking Guidelines, with industry specific guides for the Cement sector, the iron and Steel sector and the chemical (caustic soda) sector have been developed. A draft of motor system design guideline was developed and over 700 people covering 65 organizations' were trained in motor system energy efficiency.

The Energy Efficiency Standards (labeling) system and procedures were developed for industrial equipments and residential equipments (motor, air compressor, air conditioner, electric water heater).

Voluntary agreements and energy efficiency design codes were adopted by major energy consuming industries. At this stage of project implementation, the Evaluation Team has observed a very significant improvement in the national capacity for developing and implementing energy efficiency standards for industrial and residential sectors through local manufacture of various service equipment, electric motors, etc. which are at par with imported ones. It is also observed that there is a substantial increase in the market demand and sale of energy-efficient equipment in the residential and service sectors within the evaluation period.

b. Removal of barriers to effective application and practice of energy efficiency in the building sub-sector

The building energy conservation regulation was issued in Chongqing in December 2007 with plans of replicating it in different provinces. In support of national activities, the analysis of international experience in building energy conservation covering regulatory and incentive policies, and those in China was completed. Regulations and incentive policies were developed for building energy conservation. The Energy Efficiency Standards for retrofitting existing buildings was prepared for finalization. Some 100,000 sq.m. floor area of low energy consumption buildings has been built. Test on the new built low energy consumption is currently ongoing.

Four dissemination materials on buildings energy conservation were developed. Other outputs include: collection of policies and regulations on building energy conservation, administration and decision on buildings energy conservation, mechanism and modes on investment and finance of buildings energy conservation; and exploration and practices on energy conservation retrofitting for existing residential building in heating area in north China.

The Evaluation observed sufficient data and information on energy usage in buildings as basis for developing policies and measures to improve efficiency in building energy consumption practices. Various initiatives indicate a strengthened national capacity for the development and implementation of building energy performance standards starting with the increased awareness of the importance of building energy efficiency in the country. The availability of locally-developed innovative and efficient building energy technologies have increased to respond to the growing demand from the building sub-sector.

c. National human resource capacity in GoC, business, financial and technical organizations for realizing energy conservation in China increased.

Six (6) training materials were produced on motor system EE, industrial boiler and steam EE, industrial furnace EE, building heat insulation material EE, building and central air conditioning EE. The energy management capacities for 8 local energy conservation centers were increased. The local energy conservation centers were successful in developing their capacity. For instance, Sichuan Energy Conservation Center was able to obtain a total of USD 96,000 co-financing from local governments that enabled the purchase and establishment of a modern state-of-the-art energy supervision and demonstration system for energy management data collection. The experience was disseminated to other 7 energy conservation centers. The project also assisted Shandong local government to issue 100 guidelines on energy usage for industries. A permanent energy conservation exhibition was established in Shanghai. A methodology for Energy Conservation Evaluation consisting of the fixed asset investment approval process was developed for the Beijing local government. The project completed more than 200 energy audits and produced the corresponding reports and recommendations.

Other support activities included study on measures for achieving the energy conservation objectives of the 11th Five Year Plan. A study was also conducted on the current situation of financing energy conservation in China which provided recommendations on relevant policies. Various studies were conducted on the updating and revision of the Energy Conservation Law to suit changing conditions which provided pertinent recommendations on institutional and policy guidelines for the responsible government departments.

It was observed primarily that the significant improvement in the capacity of the energy conservation centers all over the country to perform services such as energy auditing, new building design inspection, conduct of training and information dissemination have bolstered the pace of outcome from the energy efficiency programs initiated by the government through strategic support of the UNDP/GEF EUEE Project. These were also made possible by the UNDP contribution to the outcome through active support in the development and implementation of the revised Energy Conservation Law and introduction of financial mechanisms to promote investments and involvement by the private sector and the general public in energy efficiency.

- *Observations and Findings:*

Contributions of the Project Outputs to UNDP Outcome

- j. Consistent with the objective of the EUEE Project, there is already significant improvement in energy efficiency of major energy end-use sectors in China. Based on the reports provided but without the actual detailed quantitative verification on the figures stated, the Evaluation reviewed the performance towards the progress in achieving the UNDP outcome. The target of reduction in energy consumption is 19.4 million tons of coal equivalent (Mtce) with a cumulative carbon emissions reduction of 11.6 million tons (42.4 million tons CO₂) by end of the first three (3) years of the project.
- k. The Evaluation has observed that for the period since the EUEE Project inception in 2006 until the mid of 2008, the reduction of energy consumption of about 10.48 Mtce has already been achieved cumulatively. The total corresponds to a cumulative carbon emission reduction of 6.5 million tons (or 26.2 million tons CO₂).
- l. Assuming a coal average present value of USD 130 per ton, the reduction achieved so far in coal-equivalent energy consumption is tantamount to a saving of USD 1.4 billion or around RMB 9 billion.
- m. If the full 12-year period (2005 - 2016) of the program is sustainably implemented, it is claimed that the cumulative carbon emissions reduction will amount to about 76 million tons (279 million tons of CO₂) over the 12-year program lifetime.

Sustainability of Impacts/Results during and after the Project

Based on the above observations, there is no doubt that the significant development initiatives and headway brought about by UNDP/GEF in the energy efficiency and climate change towards sustainable development will continue to generate the benefits during and beyond the project duration which is up to June 2010. The Evaluation has observed that with the policies and guidelines under the revised Energy Conservation Law in place, the continuing improvement in organizational infrastructures, the existence of financial mechanisms, the progress in technology development and standardization, the public and private active involvement and the commitment of China in climate change, the progress achieved so far by the UNDP/GEF-assisted EUEE Project and soft assistance

towards the UNDP energy outcome will be sustained until the project ends in 2010 and beyond.

Problems Encountered

- a. It was reported that the EUEE Project design was reviewed and adjusted to prevailing situation in China particularly in response to the development changes in energy conservation program for which the Project has to align itself. It is recalled that the project design was made in 2000 to 2004 and there were significant government structural and directional changes that all activities have to follow.
- b. Procurement procedures for supply of equipment and services in UNDP and GoC have to be made consistent with each other which took more time to finalize and implement.
- c. There was limited staff from NDRC to attend to all technical and administrative requirements of the Project.

Lessons Learned

Among the lessons learned discussed, the following were highlighted:

- a. There is a need to establish a quality assurance system in the whole cycle and value chain of sub-contracting components or activities in the projects in order to ensure effectiveness and efficiency in rendering consultancy services.
- b. The Project has also experienced some delays in the due to delayed completion of some sub-contracted activities.

3.4.3. Efficient Refrigerators Project (CPR/98/G31)

There was a clear need to strengthen capacity in China to manufacture and utilize energy efficient refrigerators. Domestic research demonstrated that the energy consumption by refrigerators in China could be reduced by as much as 40%. However, there were significant barriers for the widespread commercialization of energy efficient refrigerators. The China Refrigerator project was developed in order to address this problem. The project began in 1989 as a bilateral cooperation project between the US Environmental Protection Agency (USEPA) and China State Environmental Protection Administration (SEPA). From 1989-1995, work was conducted in the areas of CFC substitutes research, energy efficient design options, prototype development, safety testing, and field testing.

A chlorofluorocarbon (CFC) replacement demonstration was funded through Montreal Protocol Fund (\$3.5 million) received in two parts in June 1993 and March 1995.

The development objective of “Barrier Removal for the Widespread Commercialization of Energy-efficient CFC-free Refrigerators in China” project is to reduce CO₂ and other greenhouse gas emissions in China by removing barriers to wide spread commercialization of energy-efficient refrigerators in China. The project aims to promote the widespread commercialization of energy-efficient refrigerators by removing technical, market, commercial, information and other barriers to increased market penetration of the technologies and products.

The activities developed for the project can be generally grouped into those providing a “technology push” to increase the supply of energy efficient refrigerators, and those providing “market-pull” to raise retailer and consumer understanding of the benefits of energy efficient refrigerators in China.

The project has received a total US\$9,860,000 of GEF grants, and US\$31 million from Chinese government and enterprises.

The project was approved by the GEF in July 1999 and began in December 1999. Project implementation lasted 7 years. The project had successfully completed in December 2006 but there are still remaining project documentation and report preparation that are not yet completed.

The project's Implementing Agency is UNDP. The National Executing Agency is the State Environmental Protection Administration of China (SEPA), which has assigned SEPA's Foreign Economic Cooperation Office (FECO) to manage execution of the project. The United Nations Department for Economic and Social Affairs (UNDESA) is supporting the project as the International Cooperating Agency. 16 refrigerator manufacturers and 10 compressor manufacturers are involved in the implementation of the project.

- *Major Project Outputs*

The following are the project outputs achieved so far and in relation to project objectives:

- a. Develop capacity to provide a "technology push" for increasing the supply of energy efficient (EE) compressors

From project reports and interviews, the following were gathered as major outputs in terms of improving the technical performance of the compressor this is the heart of the refrigerator system. It is recognized by the local manufacturers that even though the efficiency of the refrigerators is relatively compared to international standards, there is an increasing sales of refrigerators because the public are not aware. Technical staff from 8 compressor manufacturers in China completed international design training workshops and study tours. Modifications in the designs were made and from the tests conducted, the average compressor COP efficiency has improved from 1.0 in 2000 to 1.46 in 2005. Leading compressor manufacturers followed and have upgraded their energy-efficient compressor production and manufacturing capacity. The highest COP value of newly-developed model has risen now to 1.9.

- b. Develop capacity to provide a "technology push" for increasing the supply of energy efficient refrigerators

At the beginning, the refrigerating system design was also below international standard. A total of 585 engineers received training in international technology options and computer modeling of EE measures in refrigerators. Representatives from sixteen (16) refrigerator manufacturers were provided in-depth training abroad. The 16 refrigerator prototypes addressed in the training were all improved to achieve EE refrigerator level equivalent European grade "A". From the designs that were finalized, the project supported the development and implementation of business and production plans for energy-efficient refrigerators. Towards the end of the project, considering the remarkable improvement of the refrigerators, the government issued to participating manufacturers different awards based on performance that included 15 Basic Awards, 3 Supplemental Awards, and a Principal Award.

- c. Establish incentive framework to promote the design, production, consumer acceptance, and increased market sales of high-efficiency refrigerators and compressors

Toward the last stages of the project, the implementation of new minimum efficiency standards and establishment of process for periodic revision of standards was started and formalized through issuance of guidelines. At the same time, in order to provide a continuing improvement process and motivation, a system of financial incentives was established which has started awarding to manufacturers who undertake the design and production of energy-efficient refrigerators.

In order to show government support for the EE refrigerators, the Ministry of Finance and NDRC jointly issued "Government Procurement Notification on Energy Efficient Refrigerators" which also developed capacity to implement a mass-purchase program for EE refrigerators. In the same vein, as developed also by the Project, the government implemented of dealer incentive program or also called the "Retailer Incentive Program" which was launched and conducted for a period starting 1 May to 31 October 2004. The sales data collection system was established to monitor the progress of the program.

- d. Create market conditions of increased consumer demands for energy efficient refrigerators through consumer education, and increase capacity of sales force to promote energy-efficient refrigerator sales

In line with this objective, starting March 2005, the GoC has required the compulsory Energy Labeling to be adopted for all energy efficient refrigerator sales. A broad range of public educational, market, and promotional campaigns were conducted through the Project. The advertising campaign obtained the famous international advertisement award known as the "EFFIE Award".

In order to provide for market development support, the Project conducted activities that increased the capacity in retail channels to understand and promote the sale of energy-efficient refrigerators through the "Retailer Education Campaign" for training of retail staff at 56 key marketing units in Beijing, Shanghai, Guangzhou, Xian and Wuhan.

- e. Establish national capacity to promote and manage energy efficiency in the refrigeration sector

On the information collection and management system, the Information Center established by the Project completed collection of initial project results for 2000-2005 for dissemination to the public. A Testing Center was also established to support the monitoring and evaluation system established for the Project in order to track on project progress and refrigerator sub-sector development. More than 150 groups of sample refrigerators have been tested and results published for the program.

- *Observations and Findings:*

Contributions of the Project Outputs to UNDP Outcome

The Evaluation Team visited the PMO and discussed their activities and achievements with them. Based on these visits and the documents reviewed, the Evaluation Team makes the following observations to link the project outputs with the UNDP outcome:

- a. The Project has achieved significant results in a variety of areas. First and foremost, the number of manufacturers producing energy efficient refrigerators and the number of energy efficient refrigerator models produced has significantly increased as a result of the project. Annual production of energy efficient refrigerators went from about 1 million in 1999 to 10.6 million

in 2005. The average refrigerator energy index has improved from 0.794 in 1999 to 0.566 in 2005, for a gain of 28.7%. Production of super-efficient refrigerators (those at least 60% more efficient than the energy efficiency standard) has increased from 400 units in 1999 to 3.3 million during the 12 months ending in June 2005. There are currently 256 models of domestically manufactured energy efficient refrigerators on the market which meet the energy efficiency requirement of grade 1 of the National Standard for refrigerator energy consumption (superior to European grade A).

- b. The project's original target was to promote sales of 20 million energy efficient refrigerators over a 10 year impact period during and following the project after the project has achieved market transformation. Based on average efficiency gains of 40% relative to the baseline, each energy efficient refrigerator sold results in CO₂ emissions reductions of 5 tons over its lifetime, for total target estimated emissions reductions of 100 million tons CO₂ equivalent. The 16 refrigerator manufacturers participating in the project produced a total of 39.58 million refrigerators between 2000 and 2005, meaning that the project goal has been exceeded by a factor of two in about half of the time. If current sales levels of over 5 million energy efficient refrigerators per year continue, a total of sixty million energy efficient refrigerators will be produced in the ten years beginning in 2000, exceeding the project goal by a factor of three. Even more impressively, based on the Independent Expert Evaluation Report, total emission reductions for refrigerators produced through 2010 will be 630 million tons of CO₂, exceeding the original project target by a factor of 6.3.
- c. Finally, the project cost effectiveness target has also been significantly exceeded. The original GEF cost effectiveness target was \$0.0001/kWh saved or \$0.10/ton CO₂ emissions reduced. Actual cost effectiveness for emissions reductions estimated by independent evaluation report from refrigerators produced through 2010 will be \$0.000015/kWh saved and \$0.015/ton CO₂. If the 10 year period after project completion were concluded, cost effectiveness would be even better (~1/10th of the target).
- d. The project has been highly effective in reducing greenhouse gas emissions in China by markedly increasing the production and sales of energy-efficient refrigerators and refrigerator compressors. The market for refrigerators is now dominated by units meeting the highest two grade specifications (1 and 2), and refrigerator manufacturers are focused on delivering consistently higher efficiency products.
- e. Greenhouse gas savings estimated for the project are highly significant in a national context. From initial computations done during the discussions, though the Team was not able to verify it in detail, the reports show that the Project has exceeded its target by 1.7 times.
- f. Capacity building activities undertaken by the project, including training for technicians and engineers from compressor and refrigerator manufacturers, training activities focused on appliance retailers, public awareness campaigns, and on-the-job training for Project Management Office personnel and experts, have been for the most part very effective, and the persistence and sustainability of capacity gained through the Project in areas of technical capability and project management is highly likely to be remain even after the Project.
- g. With the exception of a very few quite minor issues, Project participants uniformly reported that project organization was very good, with clear structure and communications, transparent project accounting and bidding practices, and good support from project management.
- h. The overall design of the Project was described as very good by all of the participants interviewed by the evaluation mission in terms of clarity of purpose and logic of approach.

- i. The Project was highly relevant to the needs of the Chinese appliance manufacturing sector in general, and, to the goal of reducing China's greenhouse gas emissions in particular.
- j. The Project's performance was by and large excellent, and produced impressive results in the many areas of the Chinese appliance industry it involved.
- k. Audit Service Center for Foreign Loan and Assistance Projects found project accounts to be, with very few exceptions, accurate, complete, and according to UNDP and PMO standards. Four minor instances where project participants (manufacturers receiving awards) had not initially used correct accounting procedures or had not correctly identified purchased equipment as having been underwritten by Project funds were easily and quickly rectified.
- l. The Project has been very successful in reaching and exceeding nearly all of its goals. The only major area where the Project did not perform as intended has been the inability to start a recycling program to safely and permanently retire older, poor-efficiency refrigerators.

Sustainability of Impacts/Results during and after the Project

The capacity building activities undertaken by the Project, including training for technicians and engineers from compressor and refrigerator manufacturers, training activities focused on appliance retailers, public awareness campaigns, and on-the-job training for Project managers and experts, have been for the most part very effective, and the persistence of capacity gained through the Project in areas of technical capability and project management is highly likely.

The Project was highly relevant to the needs of the Chinese appliance manufacturing sector in particular, and to the goal of reducing China's greenhouse gas emissions in particular. The Project's performance was by and large excellent, and produced impressive results in the many areas of the Chinese appliance industry it involved. With the significant buy-in and support by the private sector, the results and impacts of the Project will undoubtedly be sustained.

Problems Encountered

While the project design was generally acclaimed to be very logical and easily understood for effective implementation, the Project experienced some delays which could have been avoidable. Since the project implementation followed strictly the PRODOC schedule of activities, the Project saw that the sequencing of activities can be improved. For instance, the promotion and information activities of the Project were not started because the technical standards were not yet developed and established. Hence, the promotion and information campaign cannot be started.

Lessons Learned

Among the lessons learned discussed, the following were highlighted:

- With the exception of a very few quite minor issues, Project participants uniformly reported that project organization was very good, with clear structure and communications, transparent project accounting and bidding practices, and good support from project management.
- Regarding the project design and timeframe, it was commented that if there will be similar projects to be designed, parallel rather than series

pattern of steps must be taken to avoid unnecessary delays in waiting for input-output timing. For instance, it was suggested that the promotion and public education should already be commenced while the technical standards are still being developed and adopted in cooperation with the authorities.

- On the accounting systems, although manifested in very minor instances and quickly rectified, there is also need to emphasize reminders and management systems on full accountability and governance in the project funds to avoid possibility of similar incidence.
- On the non-performance or delay of a project output, for instance, on recycling program of old and non-compliant refrigerators, appropriate reprogramming should be done and requirements planned out before the PMO ceases to operate by project completion.
- The role of UNDP and UNDESA is also an important key to the success of the Project. Involvement of UNDP and GEF were described as a critical component in gaining the attention, acceptance, and respect of project participants ranging from manufacturers to government and quasi-government agencies to individual consumers.

3.4.4. **TVE – Phase II Project (CPR/99/G31)**

Township and Village Enterprises (TVEs) were established from the 1950's in China as rural, collective entities established at the township and village level. There are around 23 million TVEs in China, accounting for around 30% of GDP and providing around 143 million primarily unskilled rural jobs. TVEs provide more than half of the total output from the building materials (cement and brick), coking and metal casting sectors. These four TVE sectors account for one-sixth of China's CO₂ emissions.

The overall GEF goal of the project was to reduce greenhouse gas (GHG) emissions in China from the TVE sector by increasing the utilization of energy efficient technologies and products in the brick, cement, metal casting and coking sectors.

The strategies of the project included the following as: a) creating institutional mechanisms for barrier removal at the national, county and enterprise levels; b) establishing incentives and monitoring systems to strengthen existing regulatory programs at the county level; c) building technical capacity for energy efficiency and product quality improvement in TVEs; d) creating special access to commercial financing for TVEs in industries in the four sectors to undertake energy conservation and GHG emission reduction activities; e) commercializing the financing of TVE energy conservation projects; and f) expanding the application of best practices for local regulatory reform to the national level.

Phase II of the project was supported by a GEF grant of US\$ 7.992 million and planned Government of China (GOC) and other co-financing (in-kind and in-cash) of US\$ 10.55 M.

In February 2001, Phase II of the project was launched for a planned four-year implementation period.

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For the project, UNDP was the international Implementing Agency, UNIDO was the international Executing Agency, and MOA on behalf of the GOC was the domestic Executing Agency. UNDP and UNIDO have involved the project in their assistance

program for China to help achieve their objectives to support sustainable industrial development in China.

There are around 23 million TVEs in China, accounting for around 30% of GDP and providing around 143 million primarily unskilled rural jobs. TVEs provide more than half of the total output from the building materials (cement and brick), coking and metal casting sectors. These four TVE sectors account for one-sixth of China's CO₂ emissions. Key drivers in updating TVEs in a step-by-step process from their very backwards 1950's technology, investment and management levels are to improve their competitiveness and to reduce their high pollution levels. The Project had a challenging start and made numerous adjustments to evolving project circumstances and early implementation results.

- *Major Project Outputs*

The Evaluation Team visited TVE-II PMO and discussed their activities and achievements on the project. Based on these visits with the officers and staff consulted and the documents and reports reviewed, the Evaluation Team has the following observations on the project outputs and progress towards achieving the intended outcome.

- a. creating institutional mechanisms for barrier removal at the national, county and enterprise levels

The policy and institutional infrastructures and mechanisms for the adoption of energy-efficient technologies in the TVEs have been observed by the Evaluation to be existent and effective at various levels. The barriers identified by the project during its development (pre-project) stage helped in designing the project in a logical manner thereby facilitating its effective implementation. Based on the technical progress achieved in the demonstrations supported by the TVE Phase II Project, the local governments have fully supported and promoted the enforcement of a national policy encouraging use of hollow bricks to discourage the less efficient unmixed clay bricks and solid clay bricks. The continuing progress has led to the development and adoption of technical standards in the production of the hollow bricks to completely remove the barriers originally identified.

During the project implementation, the Hongyuan Company, a commercially focused support unit, has been developed as a scheme and was actually established by the project to give foster closer working relationships and coordination among the stakeholders including the TVEs, EE experts, technical consulting service providers and the R&D institutes. At the present stage, the Hong Yuan Company has been observed to be accumulating further experiences and enhancing its business capacity to be a support institution for the TVE technology improvement program. But due to the institutional constraints and concerns, the future of Hong Yuan Company is still unclear and remains to be a challenge for the project and the UNDP program.

- b. building technical capacity for energy efficiency and product quality improvement in TVEs

Based on reports and interviews, the Evaluation observed that significant technical capacity for energy efficiency has been started to be built in the PMO, government agencies involved and the TVEs. Technical renovations and efficiency improvement projects have been accomplished in 8 pilot TVEs and 101 replication TVEs which have resulted to actual EE project implementation in TVEs. Without going into detailed quantification review, the evaluation has found

that the project initiatives have been generating energy savings of 373,000 tce per annum, or a total of 930,000 tons CO₂ emissions reduction per annum, far beyond the projected levels.

Technical renovations in two (2) brick-making pilot TVEs and 60 brick-making replication TVEs were completed. This has enhanced the competitiveness and marketing locally-produced hollow bricks. With the experience, the local governments have provided own inputs to take advantage of the opportunities offered by the technology improvements and have fully supported policy to encourage the hollow bricks produced through energy-efficient means.

The technical capacity has been proven to be existent by the fact that the energy-efficient tri-arch Hoffman kiln technology has been successfully applied in brick-making in involved TVEs. This practice as initiated by the TVE –Phase II Project also helped in putting up a national standard for hollow bricks, i.e. the JC982-2005 standard.

Supported by the project, the successful construction and operation of the first waste heat power generation plant ever applied on a 5-stage pre-heater NDP cement line in China have promoted the issue of a incentive policy by Zhejiang government to encourage the apply waste heat power generation technology onto NDP cement lines, i.e. to connect to the grids free of charge, simplify the approving procedures, etc. Besides, the technology has been brought in to the national program (National mid-to-long-term program for energy conservation) by the NDRC. It is decided under the program that the technology will be replicated at about 30 NDP cement lines.

The “Clean Type” coking oven plus the waste heat power generation technology has designated as a key national technical renovation project, and ranked key promotion technology in coking sub-sector by Shanxi provincial government.

Besides 118 replication TVEs directly supported by the project, representatives from about 400 additional enterprises have visited the project pilot TVEs to learn their EE technology. Among these, the coking technology and new type EE Hoffmann kiln for brick making have been recognized by foreign enterprises from India and Bangladesh, etc. The independent replication capacity of the project has built up.

- c. creating special access to commercial financing for TVEs in industries to undertake energy conservation and GHG emission reduction activities

As supported by the TVE Phase II Project, the Revolving Capital Fund (RCF) has been playing a significant role in financing technical renovation projects in the four sectors selected in TVEs. As a financial leverage mechanism effected by the RCF to provide support and financial access during the construction of pilot and replication projects, it was reported that the progress and encouragement have been revealing and the trends in effectiveness is hoped to be increasing steadily. Furthermore, the practice of RCF did not only come out like a consensus position by the project stakeholders but also manifested a way for them to support environmental friendly projects and likewise motivate TVEs’ enthusiasm for self-financing.

- d. commercializing the financing of TVE energy conservation projects

With the experience in the piloting of this financing scheme and generating awareness among the selected TVEs, the project looks forward to further

improvements in the RCF and other planned financing mechanisms towards commercializing them for all the TVEs at the national level.

- e. Expanding the application of best practices for local regulatory reform to the national level

The project takes a lead in introducing Voluntary Agreement (VA) into TVEs, which is not only an innovation of governmental administration, but also helped in raising greater TVEs' awareness to energy saving and protection of the environment through climate change programs.

The positive results and impacts achieved so far by the TVE Phase II Project have received broad attention in the country level and in the international organizations. According to reports, UNDP is recommending the project as a model GEF-supported project to GEF, the RCF was chosen as a SME financing scheme case study by the World Bank and a media tour was organized to publicize and promote the project by UNDP China.

- *Observations and Findings:*

Contributions of the Project Outputs to UNDP Outcome

In summary, the Evaluation Team makes the following summary comments and findings on how TVE-II project has been contributing to the UNDP outcome:

- a. The overarching TVE evaluation finding is that the project has been very successfully implemented, has achieved far greater than anticipated GHG reductions, and leaves a strong sustainability legacy.
- b. In the eight pilot-demonstration projects implemented, GHG savings of 193,192 tons CO₂/yr have been achieved compared with the 85,000 tons/yr CO₂ savings anticipated in the project's design. Around \$49 million of co-funding was invested in these pilots, including \$10 million from commercial sources, leveraged from an \$800,000 contribution from GEF.
- c. In addition, 111 out of 118 formal replication projects, with CO₂ reductions of 1.3 million tons/yr are achieved or underway (with 714,000 tons/yr CO₂ savings in 101 projects implemented to date) - with funding provided by GEF and the TVEs, as well as from a range of grants, policies and other support from various levels of the Chinese government. These results are a significant advance on the project design target of 1 million tons/yr of CO₂ reductions to be identified and designed in detail in 100 feasibility studies, but not necessarily to be implemented during the project's operation. GEF's \$2 million has leveraged around \$100 million of co-funding in these 101 replication projects.
- d. The use of the PIC and LPICs – national and Local Policy Implementation Committees – was a particularly relevant project design element– in particular in China's current stage of social market development. With the pro-active effort of the PMO, these policy co-ordination mechanisms provided strong and effective project leadership and co-ordination. The project also greatly benefited from strong policy implementation linkages. In particular, the project made good use of PMO and PIC links to assist the development of policies to prohibit some outdated and energy inefficient technologies as well as by provincial, city and district authorities. Through its LPIC links, the project then enhanced the local enforcement of such lists of prohibited technologies.
- e. The use of formal co-operation Voluntary Agreements (VAs) between the TVE project, local government agencies (through the LPICs), relevant industry associations and pilot and formal replication sites proved to be very effective in China's TVE sector. The VAs facilitated tangible energy efficiency

actions through a formal framework that coordinated global GHG objectives, national objectives and local environmental, employment and competitiveness objectives.

- f. The project has clearly fostered a considerable number of independent energy efficiency self-replications that have been implemented as multiplier effects of the initial direct seed funding project support by UNDP/GEF. These self-replications arose from the extensive technical training provided by the project, site visits and training provided by the pilot TVEs (including on a for-profit basis), project publicity efforts, the interest in energy efficiency arising from the project's pilot and formal replication results, and from the efforts of the LPICs to locally disseminate the technologies demonstrated by the project. These self-replications are estimated to account for around 30 million tons of lifetime CO₂ savings and an un-quantified but clearly large amount of co-funding. There also seem to have been self-replications in Bangladesh, India, and USA– but with also as yet un-quantified results.

Sustainability of Impacts/Results during and after the Project

- a. The close UNIDO management of competitive bidding and implementation of 42 TVE project subcontracts has clearly been a major contributor to the project's success. The Ministry of Agriculture's (MOA) strong support has also clearly been a critical project success factor. The TVE Project is clearly suitable for UNDP/ UNIDO and GEF promotion as a world best practice project in the rural industry/SME sector and promises to overcome all the challenges towards sustainability goals.
- b. There is a clear positive trend that the physical accomplishments scored by the Project will be sustained in even higher magnitudes and earlier achieved than originally earlier projected in project design. The projected CO₂ reduction will even be scaled up as the twelve remaining cement plants are implemented. The trend is evident to continue in the years to come.

Problems Encountered

- a. The Project has to make several project adjustments to attune itself to the changing situations. Through the policy dialogue which is built in the project design, there was consensus that the RCF will be modified from a fund into an RCF Mechanism. Other modifications done were the replacement of the PTPMC by the Hong Yuan Company as a commercially-focused support unit, the substitution of originally chosen non-complying pilot projects by better qualifying enterprises, and the replacement of the pilot project technologies that represent current practice.
- b. The delays in the project's implementation appear to be reasonable in terms of having been primarily due to external factors over which the project had no control (e.g. the outbreak of SARS) as well as changing policies that not have been anticipated.

Lessons Learned

Among the lessons learned discussed, the following were highlighted:

- a. The focus and training arising from the attempts to implement the RCF fund provided the necessary capacity and motivation for both ABC and TVE enterprises to utilize non-GEF funding sources to implement energy efficiency measures in all the pilot/demonstration projects and formal replication projects. The GEF funding component was only 0.4 - 20% of renovation funding in the 8 pilots that were implemented. The pilot TVEs provided

significant training assistance by hosting visits. The hosting of such site visits was a prime driver of the large number of independent self-replications, a highly useful outcome that was not specifically articulated in the design or funded by the project.

- b. The project identified that there are still very large untapped energy efficiency potentials in the four TVE sectors. In particular there is a major challenge remaining to update the more than 90,000 brick kilns throughout China that provide 95% of local rural construction materials. The energy efficient tri-arch Hoffman kilns demonstrated and replicated in the TVE project still need to be further developed and disseminated. There is also a need to introduce and prove the next brick-making technology, the tunnel kiln. The use of tunnel kilns would improve brick quality for increased insulation levels for the buildings using the bricks, as well as reduce the use of materials. There is also the potential to utilize heat recovery technologies for power generation in tunnel kilns by using industrial wastes of mixed partially burnt furnace coal and slag as a fuel and brick material. Simple access for such export electricity at fair technical and financial terms will be a key issue, as shown by the strong replication for export power from cement kilns where this support was available, and the lack of coking heat recovery power generation replication where such fair access was absent.
- c. On the project's design and implementation, the project final evaluation also suggested the desirability of having a more explicit focus on the overarching project purpose or outcome level, rather than on the achievement of a long list of specific project outputs. This project purpose focus could have included supporting self-replication projects and the quantifying their results worldwide; and on supporting and quantifying the co-funding achieved through ABC and TVE self-investment, rather than just focusing on the limited funding available from the GEF contribution to the RCF.
- d. The benefits could have been even bigger if the access to the grid for appropriately-priced export of electricity from the TVEs surplus when the full potential is tapped.
- e. The flexibility to make project implementation adjustments which is normally incorporated in UNDP/GEF project designs has actually opened possibilities for the Project to adjust to changing directions and practice (since most of original assumptions have changed) in order to continue to make the Project relevant and responsive to the needs of China. The promptness to decide on project adjustments through the decision-making protocols among the stakeholders has been recognized as crucial to adhere with timely decisions.

3.4.5. CDM Capacity Building Project (CPR/01/002 - CPR/02/H02)

The energy infrastructure in China is heavily dominated by inefficient coal use, which is having a serious impact upon urban air pollution, people's health and the environment. There are vast opportunities in China for low cost GHG reduction projects through the CDM projects. The program started at a time that the Clean Development Mechanism (CDM) was in its infancy, as also acknowledged in the project document. Currently the worldwide CDM market is very active and increasingly competitive.

The Project has the following objectives: strengthen Government institutions' ability to implement procedures that will enable Chinese industry to gain smooth approval for suitable CDM projects from the national and international CDM bodies; provide stakeholders with the skills and knowledge to enable CDM projects to be developed in China; prepare CDM pre-feasibility studies for enterprises and foster the capability of consultant companies to provide CDM services; project coordination, information dissemination and cooperation with other CDM capacity building initiatives. The

project takes charge of facilitating implementation of pilot CDM projects, summarizing key findings and providing feedback to improve the administrative framework and procedures for CDM in China.

The Project strategy consists of: a.) assessing the current strengths and weaknesses of the CDM framework in China and holding a series of workshops to present recommendations for improving them; b.) identifying the training needs of the key stakeholders with regard to the CDM and creating a training strategy and materials to improve them and through running training sessions, study visits, international study tours, and through sponsoring attendance at key events like the meetings of the Conference of the Parties; c.) assessing the potential sectors and projects that have most CDM potential and supporting the development of pre-feasibility studies in different areas, e.g. renewables, energy efficiency and methane utilization; d.) holding regular CDM stakeholder meetings, creating a CDM newsletter for China, fostering closer links between the CDM community in China and internationally, establishing an improved CDM project database and website.

The Project received a total funding of USD 1.18 million, consisting of USD 50,000 from UNDP Thematic Trust Fund (TTF), USD 400,000 from UNDP foundation and USD 733,000 from the Government of Norway.

The Project was implemented from 2003 to end 2007 which was as indicated and planned in the Project Document.

A National Project Coordinator, assisted by the PMO and international and national experts, was responsible for the day-to-day management and coordination of all activities, as well as for coordination with other ongoing CDM capacity building activities.

The implementation of CDM in China will be a challenging and complex process, requiring the participation of many stakeholders. This will require the development of sufficient capacity to deal with the institutional, financial, technical, and legal issues that are associated with CDM projects.

- *Major Project Outputs*

There were four components included in the project design: Policy, Training, Pilot Demonstrations and Dissemination.

a. Policy Component

The policy component has successfully assisted in the reformulation of the Chinese measures for CDM. Several of the key recommendations have been accepted and included in the Measures for Operation and Management of Clean Development Mechanism Projects in China. Policies accepted by the Chinese government include: 1) arrangement for the CER revenue sharing between the project entity and the Chinese government, 2) explanation and clarification of sustainable development, and 3) the requirements for enterprise participation in the CDM.

b. Training Component

- As a capacity building project, the training component is the most significant and important component of the Project it has created awareness on CDM, and triggered the idea among project owners and consultants to become active in the field of CDM.

- The CDM training capacity in China was developed, and several additional training courses were held, in addition to those that were initially foreseen in the project document.
- The vast majority of training participants rated the training as 'very useful', whereas a small minority rated the training as 'useful'. Most training participants have remained active in the field of CDM, either as project owner or as consultant.
- The training activity of the Project is seen as complementary to training activities of other CDM capacity building programs.
- The Project trainers, training materials and training locations are generally rated good to very good.

c. Pilot Demonstration Component

The pilot demonstration component of the CDM Project has provided a number of key 'early CDM projects' in China, which helped to prove that CDM was 'real' and that has triggered an impressive number of follow-up projects. Almost no Chinese wind farm projects are currently developed without the help of CDM.

- The Huitengxile wind farm was registered with the EB of the UNFCCC on 26 June 2005, as the first registered China CDM project and the first registered wind farm project in the world. The pilot has triggered 43 registered CDM wind farm projects in China by September 2007.
- The Taishan Huafeng Cement Works Waste Heat Recovery and Utilization for Power Generation Project was registered with the EB of the UNFCCC on June 2006. It is the first registered energy efficiency CDM project from China, and also formed the basis for an approved methodology, AM0024. It triggered a considerable number of follow-up projects, most of which are in the validation stage and use consolidated methodologies.
- The Nanjing Tianjingwa Landfill Utilization Project was registered with the EB of the UNFCCC on December 2005. It was the first registered Chinese landfill gas CDM project, and the first Chinese CDM project to obtain CERs. The project was followed with the registration of 4 more Chinese landfill gas projects, and a total of 25 additional Chinese landfill gas capture projects have been submitted for validation.
- The Huainan Pansan Coal Mine Methane Utilization and Destruction Project was registered with the EB of the UNFCCC in March 2007. It is one of the first projects that submitted methane baseline methodology and monitoring methodology in the world, and the second CMM/CBM project from China registered with the EB of the UNFCCC. A total of 54 other projects using CMM/CBM projects have been submitted for validation, of which 52 are located in China.
- More than half of the respondents in the telephone survey who are still active in the field of CDM and are developing CDM projects have indicated that their choice of projects to be developed is 'much' or 'very much' influenced by the pilot projects.

d. Dissemination Component

The Project supported the development of a website that is considered the key official bilingual information dissemination channel on CDM in China: <http://CDM.ccchina.gov.cn>. The website is very frequently consulted for information on CDM regulations and CDM project approvals. The website is generally considered useful to very useful, and has great authority. The number of hits as of March 2006 was 142,000 and by end 2006, the Chinese website had received 200,000 hits and the English website 20,000 hits.

- *Observations and findings*

Contributions of the Project Outputs to UNDP Outcome

- The Project's capacity building program is considered as very important. Those in the position to judge the contribution of the UNDP programme vis-à-vis other programs rate its contribution as very significant and the overall assessment as nearly unanimous 'very positive'.
- China has made impressive gains in its share in the worldwide CDM market, and also made significant progress in the rankings of CDM host countries. Approximately half of all the projects starting the Global Stakeholder Process (GSP) of the validation during 2007 come from China. China also accounts for 25% of the projects registered in 2007. In both cases, the 'baseline' was a low market share of around 5% of the projects validated/registered, demonstrating China's impressive growth in market share in what is a fast growing market worldwide in any case.
- China's increasing dominance in the international CDM market can in part be explained by the size, structure and growth of its economy; however, these changes are in part thanks to China's high capacity to develop CDM projects relative to its main competitors.
- CDM in China has contributed to several major sustainable development goals of the Chinese government. This includes especially the promotion of renewable energy and regional development objectives.
- China has set up a system in which projects with relatively low sustainable development benefits, and high profits, will need to pay a high levy that will go into the CDM fund. This CDM fund will be used to pay for activities in the field of climate change with a planned high sustainable development impact. This means that potentially also these projects with low intrinsic sustainable development benefits will contribute significantly to sustainable development.
- The contribution of CDM to China's poverty reduction objectives and to technology transfer so far seems more limited. However, it should be pointed out that this finding is not particular to China – it is inherent in the concept of traditional, project-based CDM.
- China's success in the global CDM market – and the resulting favorable impact on China's sustainable development – is in part the result of its strong CDM capacity.

Sustainability of Impacts/Results during and after the Project

The sustainability of the programme is obviously high. This may be clear from the large number of replications of the pilot demonstrations of the Project. After all training courses were completed by the Project, the demand for CDM training has been mounting, as indicated by the fact that the PMO still received many requests for training courses.

Problems Encountered

With growing activities and need to provide effective guidance to CDM project developers who are expanding in number, there is already a need to establish a strong coordination mechanism among the relevant GoC stakeholder agencies, other CDM-related projects in China and the donors/partners.

Lessons Learned

- a. A national CDM coordinating agency to strengthen the function like the Steering Committee of the Project has been deemed necessary to assume the function for complementing and coordinating the related activities to harness synergies and minimize overlaps between projects.
- b. With the Project facing issues to further strengthen the CDM capacity building, it recognized the wide difference in background of the participants, both in

terms of knowledge about CDM and the professional attainments. A strategy to package and implement the training programs into different levels of training has been deemed necessary.

3.4.6. **Carbon Finance Project (CPR/06/305)**

UNDP considers that the interventions to address climate change should be part and parcel of overall sustainable development efforts and integrated into national strategies for poverty eradication through innovative approaches to policy formulation and partnerships with diverse stakeholders. With the CDM alternative, promotion of renewable energy and greater energy efficiency makes the UNDP role even more important. UNDP's integrated approach to national development by focusing on enabling policy environment and strengthening human and institutional capacity through on-the-ground action is the key to combat climate change. CDM has become an important engine to achieve the Millennium Development Goals (MDGs) of China. MDG Carbon is an innovative carbon finance mechanism featuring emissions offsets derived from a pool of projects designated to contribute directly to achieve the MDGs.

As designed, the MDG Carbon Programme will help create the necessary CDM capacity in relevant sectors and areas, from all major aspects, including project formulation, access to international CDM financing and implementation support services. This is being done through hands-on practices to ensure the efficiency and effectiveness of this capacity building practice. The long term objective is to secure a flow of high quality, cost-effective carbon offsets consistent with MDG goals.

UNDP China seeks to commence a MDG-Carbon Programme with MOST, as co-chair of the National CDM Board, to develop a pipeline of CDM projects with greatly sustainable development benefits for submission to UNDP's global MDG Carbon Facility and for marketing on the voluntary market via a new Climate Exchange process. The Programme will support market studies of possible sectors and provinces where the "MDG Carbon" approach is most strategically placed. It will additionally support the design and implementation of pilot MDG-Carbon projects in China that go beyond the current "end of pipe" projects, which have limited sustainable development benefits. To strengthen partnerships, and link to the voluntary market, a design of a Climate Exchange will be explored as a mechanism for facilitating carbon trading among multinational and local firms in emerging global carbon markets.

UNDP provides a broad based package of specialist skills and project management services, combined with on-going capacity development activities and developing country public and private sector networks.

The Project has a three-year period from 2006 to 2009 as approved by UNDP. The Project actually started February 2007 and planned to be completed by Dec 2009 or actual estimated duration of 2.8 years.

UNDP, CICETE and MOST are the key stakeholders of the project management. UNDP provides implementation support services as needed. Coordination with related UNDP projects is being ensured by the UNDP China Country Office. CICETE is the Implementing Partner and MOST is the Cooperating Agency with an appointed National Project Director for the overall management of the Project and the Project Management Office.

On the overall, with China's rapid economic growth and industrialization and high population growth has led to a rapid rise in energy requirements. Due to its CO₂ intensive energy production due to coal, China will become the world's biggest CO₂

emitter before 2010. While CO₂ reduction through RE and EE appears as a solution, getting access to the international carbon market is one common challenges faced by most of the CDM project owners in China, and one of the reasons is the absence of a high efficiency matching mechanism for buyers and sellers which means a high transaction cost.

- *Major Project Outputs*

CDM plays a very important role in financing RE and EE projects and contributing to the goals of sustainable development in China. Once it finances through the selling of CERs and thus support RE and EE outcomes which otherwise would not be easily developed. The main project outputs of the project include: a strategic planning framework for MDG-Carbon Programmes on CDM, project development and implementation support for PINs and PDDs portfolio meeting MDG and research on possible establishment of a Climate Exchange through public-private partnerships. To date, 108 PINs and 29 PDDs in 12 pilot provinces have been developed; continuing capacity development of 1700 participants; established the website and database; and continuing promotion and information dissemination.

In the course of building the Chinese capacity for CDM and access to international carbon market, UNDP China will foster continuing CDM cooperation focusing on support to design and implementation of CDM projects which are mainly RE and EE projects, among other qualified projects, that will certainly contribute to strong sustainable development. The MDG Carbon Programme links to the intended outcome through: 1) GHG mitigation benefits including direct sustainable development and poverty alleviation with focus on relevant energy solutions, 2) CDM projects in less developed regions in China, 3) securing value of CER flows beyond 2012, 4) access to Kyoto-compliance and voluntary emission reduction markets and 5) high standard CDM projects. The ultimate outcome is to achieve and maintain MDGs.

The Project outputs will provide direct experiences that could build upon the lessons learned about how the mechanism can be done most effectively to achieve the desired outcome.

- *Observations and Findings*

Contributions of the Project Outputs to UNDP Outcome

- a. The Strategic Framework for China's MDG-Carbon Market that is being finalized will identify ways to integrate carbon reduction activities to the achievement of the MDGs and China's XiaoKang Goals, with an important focus on energy solutions in less developed areas of China that benefit poverty reduction and ecological sustainability.
- b. Through the innovative project development and implementation support services of the Project, the proponents coming from a wider array of projects possible under the Kyoto and voluntary MDG Carbon portfolios will have access to international CDM financing and services at lesser transaction costs and sold at good prices to UNDP's partners.
- c. The exploitation of a Climate Exchange should facilitate carbon trading for private and public sector stakeholders

Sustainability of Impacts/Results/contributions during and after the Project:

Since the Project is still being implemented, the sustainability of the project outcomes based on actual CDM carbon financing projects being realized, in

relation to the UNDP overall outcome, has to be determined based on the constant monitoring of the targets and goals set for this Project with measurable MDG-related outcome indicators.

Problems Encountered:

Due to prevailing situation of fast developmental changes and economic activities in China, the implementation timetable has been affected and may need an extension after December 2009.

Lessons Learned

While the Project is still being implemented on its second year, the following are some lessons learned so far at the project level:

- Support from provincial Science and Technology Departments is crucial to the project implementation, especially for the project activity 2-“Project Development and Implementation Support”;
- The Capacity Building activities at national and local levels for the members of the local CDM technical units are very helpful for the project implementation, especially in less developed regions of China;
- Making scientific decisions under the actual and timely needs in different area is high efficient for implementing project activities;
- The effective and timely communication between the key project partners is the important basis for the successful and fruitful project implementation.
- Research on climate exchange mechanism can have good added value to set policy guidance fro stakeholders engaged at local level on this issue.
- As a means of leveraging carbon financing for energy efficiency and renewable energy, the still ongoing implementation of the MDG Carbon Financing Project (barely halfway its 3 year implementation) have yet to see the improvement in the economics of RE and EE projects brought about by carbon finance. Some calculations show that the improvement in IRR due to carbon finance in RE and EE projects are very marginal compared to other technologies. The Project has to prove it otherwise.

3.4.7. FCB – Phase II (CPR/07/G36)

This Project will help catalyze the cost-reduction of fuel-cell buses (FCBs) for public transit applications in Chinese cities by supporting significant parallel demonstrations of FCBs and their refueling infrastructures in Beijing and Shanghai. In collaboration with the GoC, the municipal governments of Beijing and Shanghai, and the private sector, GEF and UNDP will assist the public transit companies of Beijing and Shanghai to obtain and operate 6-9 FCBs. The knowledge and experience gained through this project will enable the technology suppliers to identify cost reduction opportunities and the host public transit operators to gain valuable experience needed to adopt larger fleets of FCBs in the future. Additionally, some activities will help build capacity relating to FCBs, including strengthening policy and planning capabilities of the public transit companies and line government institutes; enhancing scientific, technical, and industrial capacity for commercializing FCBs; and increasing the understanding of FCBs to climate change among government, investment, media, and other key actors. Finally, a series of activities will focus on defining a detailed strategy for large-scale FCB commercialization in China.

The goal of the project is to reduce GHG emissions and air pollution through widespread commercial introduction of FCBs in urban areas of China. The objective

of this project is to demonstrate the operational viability of FCBs and their refueling infrastructure under Chinese conditions.

The underlying strategy of the FCB Phase II Project has built on the experience gained from Phase I, for advancing the technology in Phase II. The program is aware of the risks in seeking new technology in Phase II, however the gains in terms of advancing the state of the technology are considered worthwhile. This includes the development of hybrid technologies to improve fuel economy and to reduce costs, as well as potentially developing lower cost sourcing of key parts of FCBs from China and elsewhere. The program will be looking carefully at the proposals from various FCB suppliers. Partnerships with established global suppliers, and verifiable performance experience, testable prototypes and other mechanisms will be used to minimize the risk profile.

The GEF/ UNDP budget for the project is US \$5,963,000, which is being used for project activities. The GoC provided US \$11,439,000 as co-financing, for government staff, FCB operation, fuel costs, infrastructure, O&M and complementary activities.

The whole program is originally composed two (2) phases is now being planned to have four phases until the commercialization stage. The program started in 2002 for Phase I. The project being reviewed for this Outcome Evaluation is for Phase II being implemented for four years from 2007 to 2011.

The project is nationally executed. The GEF-funded project activities are implemented by MOST, while the UNDP TRAC-funded activities are implemented by China International Center for Economic and Technical Exchanges (CICETE). MOST appointed a National Project Director (NPD) who takes overall responsibility for ensuring that all national inputs are mobilized in a timely and effective manner, and will be responsible to the GoC and UNDP/GEF for achieving project objectives. The day-to-day implementation of the project is being undertaken by the PMO. A local project advisory committee was formed for each of the two host cities, Beijing and Shanghai.

- *Major Project Outputs*

Under the three main expected outcomes of the Project, the following outputs were observed by the evaluation:

- a. Demonstration of the operational viability of FCBs and their refueling infrastructure by setting up FCB fleets and supportive facilities in China
 - Advisory Committee and Local Oversight Committees established
 - The Shanghai refilling station was built and put into service in 2007.
 - The three (3) Beijing FCBs acquired in Phase 1 have been operated and had a total distance traveled at 18,000 km.
- b. Technical and policy knowledge for advancing commercialization of FCB technology and hydrogen refueling system
 - The 3 buses purchased in Phase 1 are being operated to gather data and prepare the feasibility study to gather more information. At the same GoC provided support to develop a local design using the hybrid system expected to be better because it uses pure oxygen. The Chinese design has taken 3 generations of FCB design. The number of units was originally 6, but the funding not was enough. The Chinese government purchased 3 units using hybrid technology. For the whole UNDP FCB program, only the FCB Project of China was significantly successful to get sufficient data among the five countries doing same FCB demonstration including India, Mexico, Brazil and Egypt.
 - Support of local city government for the financial requirements of the units and operating cost has been very helpful in advancing the technical and

- policy-related studies for the FCB application and possible commercialization in the years to come.
- c. Promoting an enabling environment for FCB expansion and support the design of roadmap for FCB commercialization
- The Project has continuously conducted public awareness through workshops, coordination meetings and media coverage.
 - The International Clean Vehicle Technology Innovation Forum gathered in Beijing 1,000 participants composed of top corporations, high government officials from relevant organization and agencies, representatives from big transportation manufacturers presenting state of the art development in related areas of interest, FCB supplier companies, local and foreign media and participants from different sectors. The forum was very successful in achieving its objectives and coming up with advance information on fuel cell and FCB technology development and commercialization strategies.
 - The official website for the project has been constructed to enhance promotion and information exchange.
- *Observations and findings*

Contributions of the Project Outputs to UNDP Outcome

The FCB project is consistent with the China Country Programming Document (CPD) (2006 – 2010), particularly regarding long term solutions for sustainable energy services. The continuing support and technical assistance will contribute to fulfillment of obligations under multilateral environmental agreements, especially regarding China's commitment to the Kyoto Protocol where fuel cell development, among other technologies, and its commercialization through demonstration and development of strategies, guidelines, standards and regulations.

Sustainability of Impacts/Results during and after the Project

The sustainability of the FCB project impacts will be under constant monitoring as the FCB program goes through a series of four phases towards full commercialization targeted in 2020.

The GoC derives very vital information on the project that will be very useful not only for its own developmental benefits but also for the international community interested in the FCB technology application. China actively participates in the International Partnership for Hydrogen Economy (IPHE), and has developed a cooperative relationship with the US, European Commission, Canada, France, Italy and the UK in the sectors of sustainable development, renewable energies and hydrogen/fuel cell. All of these activities demonstrate that China considers the UNDP/GEF FCB program as an important factor in reaching its mid-to-long term goal of commercializing FCB technology in China.

Problems Encountered

Because of the relatively new technology development in FCB, the process of procurement of the units took much longer time than expected. The RFP for the Shanghai units has undergone many revisions until finally it was released in August 2008.

The cost considerations are still very substantial (around USD 1.6 million per unit) because it is still in the development stage. This has limited the scale of the project investigations because available funds can only support three units instead of the original plan of six (6) FCB units.

Lessons Learned

Considering the magnitude of resources required for China to continue with its commitments in the FCB technology development and commercialization, the GoC has actively supported the development of local technology using local expertise and another technological approach using hybrid power models instead of pure hydrogen vehicles.

4. OVERALL UNDP OUTCOME EVALUATION

4.1. Overview

Section C of the Terms of Reference has listed the different issues that the Outcome Evaluation has to address. This part of the report presents the three levels of analysis consistent with the prescribed methodology. At this point, it is important to remember that in the following sections, the projects analyzed in Chapter 3 are considered to be the components/elements of the UNDP RE and EE program (under the climate change and sustainable energy portfolio). This Evaluation has to analyze how and up to what extent this sub-program consisting of the seven (7) projects contributes to the UNDP outcome, to reiterate:

<p>UNDAF Goal: Outcome 3 – More efficient management of natural resources and development of environmentally friendly behavior to ensure environmental sustainability</p>
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4.2. Outcome Analysis

4.2.1. Renewable Energy (RE) and Energy Efficiency (EE) in Sustainable Development

The seven (7) RE, EE and CDM projects reviewed have all included in their goal and objectives sustainable development for China, particularly in poverty reduction and protection of the environment through improvement in the use of energy and applications of new and renewable energy. The results of the projects show that indeed, the sustainable development in the big industrial sector, remote villages, town and village enterprises, transportation, residential and commercial sectors have all been covered and are producing outcomes that are exceeding the project expectations. The indicators reviewed include the amount of energy saved or augmented by usage efficiency or new indigenous renewable energy forms, respectively. Based on the reports on studies conducted, reduction of cost and better overall economics in these applications have been clearly demonstrated improvement expected in the pilot sites and consumers which are readily replicable to other areas.

4.2.2. Improvement of Basic Services

Availability and improved access to modern and efficient energy use have been demonstrated to have provided beneficial results in lighting, transportation, communications, livelihood opportunities, education, health and sanitation, governance, manufacturing enterprises, agriculture, electrification, water supply and many other public services. The benefits are not only coming in from the sustainable energy supplies but also in the form of better environment derived from lesser GHG and lower carbon activities. There is no doubt that the energy services provided through the projects link very well to the improvement of basic services especially in the prioritized areas chosen by GoC in relation to its MDGs plan.

4.2.3. Improvement in National Coordination Mechanisms

Because of the inherent need for cooperation and resource inputs towards common goals and objectives, the projects have developed and established systems that improve working relationships and performance of roles among partners, government agencies, public-private co-operation, and donor agencies not only on the project and program levels but also on the national level. The coordination mechanisms have improved also the institutional linkages towards producing the desired outcome and in most cases they are institutionalized and covered with laws and regulations as well as monitoring systems to track on performance. New institutions are established to make the improvements permanent, like the formation of national coordinating committees, industry associations, energy conservation centers, advisory groups and oversight agencies. UNDP proved to contribute excellent partnership mobilization with well designed structures and systems to make the relationships effective and results-oriented. Regular meetings, progress reviews and efficient information dissemination have contributed to a large extent in strengthening the coordination and networking among the project players to think in the national perspective always. The strategy also draws strong commitment by all stakeholders.

4.2.4. Establishing Needed Standards and Guidelines

The projects also saw the need and achieved or in the process of completely achieving project targets for establishing standards in the different technologies and services covered by the seven projects. These standards and guidelines are approved by the relevant government agencies and adopted together with the all other standards and guidelines established. The process involves institutionalizing them through consultative and participative approaches where private sector and civil society organizations involvement are encouraged and maximized. This Evaluation noted the remarks by persons interviewed that the secret of success in drawing the various stakeholders into these kinds of industry settings is the credibility and capacity building brought in by UNDP using international best practices and expert advice directly or indirectly supported by the projects.

4.2.5. Establishing Market-Based Mechanisms

The projects were successful in bringing in market-oriented approaches applicable to RE and EE technologies and suitable to the evolving economic and business situation in China. The projects were implemented during a period of continuing market reforms in the whole of China. The preparedness of the public and private banks and other financing institutions to accept these proposed mechanisms that started as pilot activities is an indication that market for said technologies are ripe and the mechanisms developed are fairly distributing the risks involved inherent in new technology market introduction. The availability of seed moneys and international consultancy inputs from UNDP or brokered by UNDP with the partners are the key ingredients to success,

4.2.6. Climate Change Objectives as Integral Part of Decision Making through RE and EE

The climate change objectives are built in the strategy and design of all the RE and EE projects. The indicators of success are GHG reduced or avoided through the energy savings and new energy supplies from indigenous resources. The agencies involved in the projects have consciously included climate change in the energy planning and project prioritization process because it is already mandated and are reflected in the related laws and regulations in China.

4.2.7. Overall Public Awareness in Climate Change through RE and EE

The awareness and realization of the need to integrate climate changes issues in the decisions made in the project, program and national levels have been observed by the Evaluation. The effective use of media has increased the awareness of common people, government agencies and private companies.

4.2.8. Increasing Private Sector and Civil Society Involvement

The success has also been mainly through the acceptance to get involved and willingness to provide inputs by the private sector and civil society in a market-based approach. The inputs placed by the private sector also complemented the resources the GoC can put up to meet the total requirements of a big program like the EE and RE program. These inputs also took the form of co-financing and local participation and signify the commitment and responsibility on the role of this sector should play in the cooperation and partnership strategy. These inputs have remained during the project implementation and beyond. It was observed however that the nature of commitment have to be supported by formal agreements and clarity of roles and responsibilities and have to be included in the monitoring and evaluation system that is installed.

4.3. **Output Analysis**

4.3.1. Overview

The project profiles and the status of progress towards their own outcomes were discussed in Chapter 3 of this report. This section will now analyze the collective outputs into the overall RE/EE/CDM program output to which the output-outcome link can be traced later in the next section.

4.3.2. Relevance of UNDP Outputs through the UNDP/GEF-Supported Projects

All the outputs at the project level are relevant to the overall RE/EE/CDM program under the UNDP climate change and sustainable energy portfolio of the UNDP China. These outputs were clearly defined with their specific performance indicator and targets during and after the project. Viewed from the UNDP China strategic framework and country development plan in the program cycle 2006 – 2010, the project outputs are all relevant to the sustainable development through renewable energy and energy efficiency of various sectors in China.

4.3.3. Significance of UNDP Outputs

The outputs of the UNDP/GEF projects mostly are rated Highly Satisfactory in view of the fact that, based on reports and interviews, the physical accomplishments, capacity building and installation of coordination mechanisms were more than expected in the original targets committed and included in the respective project documents. The outputs in the installed equipment and better practices in energy saving and the additional generating capacities brought in by the new RE installations are very significant quantifiable outputs in the pilot demonstration and the replication capacities induced by the good performance and buy-in of the target market for these technologies. The corresponding energy saved expressed in Mtces of the different projects when consolidated at the national level are also very significant. The overall estimate of all these outputs, however, were not evaluated in detail for lack of time, but they can easily be verified further from the reporting and monitoring system that was installed by the PMOs in their respective projects. As a result, the corresponding GHG emissions in equivalent CO₂ reduction have reached staggering proportions.

4.3.4. Factors Affecting the Desired Outputs

The factors that affected the timely delivery of the project outputs on the overall have tended to extend the timelines for the projects. The project timelines were exceeded from the original duration in the PRODOC in some projects (and the estimated variance), and for instance, the more significant ones are in the RE Commercialization Project (2.8 yrs), the Efficient Refrigerators Project (4 yrs) and the TVE - Phase II Project (2.4 yrs). The reasons or situations happening during the project duration cited in common include the following:

- uncompleted activities in the local sites as part of local inputs to co-financing commitments,
- government restructuring,
- SARS,
- remaining reports or documentation,
- limited staff availability of the PMOs due to the high turnover rates experienced, and
- inability of the sub-contractors to comply with agreed timetable or their outputs needed some more time to meet expected standards.

4.3.5. Achievement of UNFCCC and UNDP Goals

The goals of UNFCCC and UNDP as expressed in the Country Program document and the Strategic Results Framework under the climate change and sustainable energy portfolio of UNDP China have been met by the project outputs as discussed in Chapter 3 with Highly Satisfactory ratings. With respect to the Program Cycle 2006 – 2010, this Outcome Evaluation happening in 2008 provides a mid-term assessment on the progress in achieving the project outputs in line with said goals. With the policies, institutional structures, systems and resources properly in place in the restructured government organization and market-based orientation, the outputs of existing project pilots and the replications that were encouraged will continue contributing to the attainment of the 2010 end goals of the CDP and beyond.

4.3.6. Energy-Poverty Nexus in RE- and EE-based Sustainable Development

In the design and actual implementation of the projects, the poverty reduction objectives are well taken into consideration. The increased access to energy services and the reduction of operating cost of providing energy have seen results in the improvement of basic services in the household, TVEs, the four industrial sectors, transportation, health, education, communication and livelihood opportunities.

4.3.7. Enhancing UNDP's Role and Advocacy in RE and EE vis-à-vis Climate Change

The project outputs and activities have clearly advanced the UNDP's role and advocacy to climate change and sustainable energy in the RE/EE/CDM project evaluated. The use of multimedia, information centers, newsletters, publications, radio plugs, local and international conferences and network linkages have greatly helped in portraying UNDP's mandate and achievements in these areas.

4.4. ***Outcome-Output Linkage***

4.4.1. Overview

In this section the outcome-output link will be analyzed with the view of the Program cycle 2006 -2010 and the Country Program Document for china.

4.4.2. Linking Outputs from UNDP-Supported Projects to RE and EE Outcomes in China

The government agencies of the GoC and the different partners implementing the projects have placed these projects in the core of their sustainable development programs and, in most cases, have used these projects to crystallize concepts that are now the governing sectoral policies, to develop their own capacities, to build the organizational structures, to acquire international best practices and technologies, and more importantly, to mobilize support to leverage into bigger commitments for the whole program in an integrated, results-based approach. The PMOs and government officials interviewed are unanimous in saying

that these could not have been possible or these could take much longer time if done single-handedly by the GoC.

4.4.3. Significance of UNDP Project Contributions to the Achievement of the Outcome

- a. The results are also very much aligned to the purposes and outcome intended by the UNDP and are all practically within the project timelines and budgetary allocations. UNDP China has taken the leadership role starting in the needs-based project development, to mobilization of resources, to building mutual and co-operative partnerships and to a determined outcome-oriented project implementation.
- b. One such leadership role that UNDP has taken through the projects is CDM capacity building which has contributed to several major sustainable development goals of the GoC and evolved the need for the programmatic CDM (P-CDM). This new approach has vast potential of providing a very large amount of emission reductions with lower transaction costs, and of providing greater impact on sustainable development in MDG than the present, project-based CDM. P-CDM could potentially have much closer tie-ups with key government objectives in the middle and long term.

4.4.4. Significance of UNDP Soft Assistance Contribution to the Achievement of Outcome

The soft assistance or the indirect funding assistance have clearly accelerated the pace of implementation with better grasp of the prevailing situation in terms of increased coordination, better analysis and feasibility studies, resource assessments, educational tours, and capacity building that were not budgeted in the projects. These forms of assistance were decided by the UNDP China to better respond to the implementation issues brought up during coordination, tripartite, annual project review and advisory meetings regarding the over-arching goals of such areas as renewable energy, energy efficiency and clean development mechanisms towards common goals of sustainable national development. They have augmented the resources to render more effectively and efficiently the desired outcomes on the program and national levels.

4.4.5. Timeframe Aspects of Outputs in the Achievement of the Outcome

As discussed above, there are factors that affected the timely delivery of the individual project outputs towards the collective program output expected by this time in 2008 within the program cycle 2006 – 2010. Adaptive management at the project and program levels has been done in order to ensure that the outcome expected at the end of the cycle are fully met.

4.4.6. Appropriateness of UNDP's Partnership Strategy

The UNDP partnership strategy has effectively accomplished its purpose in providing a platform for mutual cooperation and shared benefits that are the main reasons for the unity and purpose and responsibilities of bringing sustainable development, poverty alleviation and climate change measures in China. This partnership has gone a long way in generating the outcome from the multifarious outputs that the climate change and sustainable energy portfolio has been created to accomplish.

The projects have commonly made use of the UNDP's partnership strategy in mobilizing resources from different partners who shared common goals and benefits from the project undertakings. The GoC including the private sector of China have placed at stake an enormous share of inputs not only that the mutual collaboration will result to the anticipated national development benefits but more importantly because China believes in the sincerity and commitment of UNDP and bilateral partners in truly helping the country's market transformation process. The local governments' very active participation in sharing of inputs and involvement in the activities are definite acceptance of the strategy. The partnership

strategy has worked and has been very effective and clearly sustainable. The partners believe, as the PMOs have affirmed, in the merits of collective inputs and shared benefits in an atmosphere of cordiality, transparency of roles and openness to synergistic leveraging of resources towards lasting, bigger national/global impacts.

4.4.7. UNDP's Outputs to Sustained National Capacity Development

The UNDP projects, with incremental funds which are in relatively small proportion to the whole requirement, have mobilized a huge leveraged amount of GoC, international and multilateral supports in terms of technical expertise, capacity development, and pilot RE systems which are very necessary to accelerate and expand the commercialization of RE and EE technologies for sustainable development and climate change at the national level. The international posture and credibility of the UNDP approach not only attracted these necessary inputs but also signified the willingness and commitment of the partners to mutually share the costs and benefits of the developmental activities towards common national and global goals.

4.4.8. Sustainability of UNDP's Interventions related to Outcome

The UNDP initiatives and consensus-based interventions are sustainable and permanent and have clearly been integrated and become core programs in the national sustainable development plans of China. Key sustainability success factors have been satisfied through well-thought and logical interventions by the different RE, EE and CDM projects. The interventions in policy development, in the passage of requisite laws and regulations, in attracting private-public sector partnership and involvement, in acquiring the best available technologies and practices, in developing local capability, in reducing transaction costs, increasing technical efficiencies and many more, have clearly exhibited high efficiency marks, not only because these outcome elements are made as indicators of the outcome themselves but also because of the results-based M&E that all these projects have adopted as a very good management principle in tracking performance and achieving progress towards the intended outcome in the technologies covered by this Evaluation.

4.5. **Best Practices and Lessons Learned**

The lessons learned for existing and future UNDP interventions in RE and EE towards climate change and sustainable development activities include the following:

- a. Direct project financing intervention by UNDP/GEF to support RE and EE financing mechanisms as demonstrated by the projects, has gone a long way in helping develop China's energy sector to find the right mechanisms that will suit its long-term development goals and impacts.
- b. In the same token, UNDP's indirect financing intervention in general application to the sector has likewise accelerated the pace of project implementation, reduced the risks and improved the overall confidence of the stakeholders. These include support for non-project activities such as resource assessments, consultative fora, commercial exhibits, feasibility studies, foreign tours, information exchange, knowledge management, additional foreign training and expert services. The combined impacts of the soft assistance supports, as they are also called, would not have been possible otherwise.
- c. Another financing mechanism that the projects have successfully employed is the debt financing through capitalization of revolving funds as in the case of the TVEs, efficient refrigerators and buildings, and many RE project installations. Several financing structures were reported that have attracted end users because they are practical and produce results. UNDP/GEF provides monetary support in establishing seed moneys to demonstrate financing and incentive models which are intended to attract leveraging towards bigger bank portfolios on RE and EE. When the banks learn the models,

they expand their program portfolios and commits own funds due to discovered new markets. Banks become more confident and knowledgeable not only on new financing models but also the RE and EE fields. RE and EE projects are now bankable.

- d. The ultimate demonstration of complete buy-in for the RE and EE technology application is when the users themselves place their valuable resources, as observed by the Evaluation, in many RE and EE pilot demonstration projects. The replication of the demos in many independently-initiated projects supported by the Energy Conservation Centers in the provinces has followed the demonstration stage as a manifestation of serious acceptance of these technologies and attendant sustainable benefits.
- e. Partnerships somehow have also some constraints and limitations also which could come from UNDP's own *raison d'etre* and niche. There could also be different expectations from the public and private partner funders. Because of the nature and purpose of UNDP assistance, UNDP cannot fund direct support to private enterprise investments which are very much needed by RE and EE projects.
- f. Capacity building and training of energy practitioners on project development, management and consultancy appear not enough. There is continuing need in creating a sustainable demand and right compensation for their services. Otherwise, there will always be unproductive manpower attrition and could affect project implementation and optimization of project outcomes as experienced by the many projects, PMOs and government agencies. However, there is lack of knowledge on the overall manpower requirement of the long-term energy goals which appear to be ambitious. There is also unclear linkage between these requirements with the long-term goals and targets of the educational system and training programs to ensure availability of RE/EE/CDM practitioners when the time comes.

5. CONCLUSIONS AND KEYFINDINGS

5.1. Relevance of UNDP Projects in RE and EE in Sustainable Development

All the UNDP projects reviewed in this Outcome Evaluation have proven to be relevant now and in the years to come up to the end of the UNDP China Program Cycle in 2010 and beyond.

UNDP's market-based intervention in China, shifting from funding technical demonstrations to UNDP/GEF-supported or -capitalized financial mechanisms, which began in early 2000, has proven to be very effective and has now gained fruition in the country as reaffirmed by this Evaluation.

5.2. Efficiency of UNDP Projects in Output-Outcome Perspectives

- a. Most of the UNDP/GEF-supported RE and EE projects in China have followed the project designs in producing the outputs more than expected outcome in the targets originally set.
- b. The UNDP projects have lowered transaction costs and increased technology performance efficiencies which will undoubtedly reflect on the continuing trend in pursuing the outcome for the long-term.
- c. UNDP's soft assistance supports have manifold contributions in advancing the progress of the projects in realizing the outcome.

5.3. Effectiveness of UNDP Projects in Realizing the Outcome

- a. The different RE and EE projects of UNDP have demonstrated that the relatively small proportion of project funding and soft assistance from UNDP/GEF can be leveraged to meet the entire program requirement.
- b. Through efficiently designed UNDP projects and partnership strategies, the projects have effectively mobilized support from international and multilateral agencies in a more logical and programmatic way.
- c. UNDP Projects, as shown by the different projects, particularly the CDM Capacity Building Project, have pioneered in many areas and gained considerable success and effectiveness in meeting the UNDP outcomes.
- d. UNDP has been successful and effective in the market transformation for EE and RE as the projects it supported have unlocked the private and government financing for these energy projects (which were modeled also for other sectors) because they are basically improving profitability in almost all cases.
- e. UNDP's brokering role in mobilizing sources of capital in China for energy efficiency and renewable energy projects is very good and should be continued in the light of great success of such role and responsibility for RE and EE projects.
- f. However, it is observed that UNDP might have to review the sub-contracting system for outsourced project tasks and consultancy services in order to ensure timely and quality delivery of project outputs which determine future outcomes.
- g. Based on the debriefing session, it was observed that with the very satisfactory progress and status of the projects reviewed, the following needs to be given attention also: networking among R&D institutions, posture of China in the programmatic CDM, manpower requirements of the ambitious long-term RE/EE targets, high turnover rates in RE/EE field, and delays in sub-contractor outputs.

5.4. Significance of UNDP Contributions in National Capacity Development of China

- a. With the greatly improved economic growth and increased foreign reserves of China, funding support from external sources proved to be still necessary in the period of structural and policy transition through establishment of market-based mechanisms and technology improvement. Such assistance can have far-reaching impact in improving the quality of life in the remaining vast rural and poverty-stricken areas of the country which are not yet reached by market-driven and improved technology benefits.
- b. While the "market transformation" approach of UNDP for creating new markets has met many challenges in China, specially with the country's own restructuring and shift to market-based economy happening at the right time when the energy projects are also being implemented, the timetable of the projects were affected, but understandably now that, at the proper time, the objectives of the projects will still be accomplished. The results may not be very positive if force to be implemented earlier.
- c. The financing mechanisms adopted for UNDP-supported energy projects, configured into China's given conditions, have shown and provided very good examples in support of China's new market policy thrust that it has adopted for all sectors as well. In effect, by way through this energy projects, China enterprises were able to transform themselves also into covering or reallocating various market/project related risks to market players who are best able to manage the risks, a practice that they were not used to before. Loan guarantee funds established through UNDP/GEF assistance have contributed a lot in reducing the risks involved in RE and EE projects.
- d. UNDP's capacity building contribution in terms of paving the way to train and make the stakeholders and users become knowledgeable and committed to take on responsibility has been very remarkable and has long and far-reaching impacts to China.
- e. UNDP's partnership strategy in China has worked which has been very effective and clearly sustainable.

- f. China's RE/EE experience could be very useful not only for national development but also for international or bilateral arrangements in mutual experience sharing and support which may have to be established through networking of R&D centers, academic institutions and pertinent government agencies.

5.5. Trend from Past Experiences and Sustaining Realization of Outcome

UNDP has always successfully brokered for mobilizing various sources of capital from among varied partners as seen in the projects evaluated. The sources include other multilateral/bilateral organizations, development banks, private sector and enterprises, the government, and private banks. The brokered arrangements were not only for pilot demonstration projects like the TVEs, end-use efficiency improvements in manufacturing industries and buildings but also in long-term and outcome-uncertain fields such as fuel cell buses, MDG carbon financing, etc.

Continuing the UNDP support toward this direction until the end of the present program cycle to 2010 and in the next cycle will redound to maximizing the long-term benefits that have started to flow through these projects already.

6. RECOMMENDATIONS

6.1. Framework of UNDP Support to RE and EE towards Climate Change and Sustainable Development

It is recommended that UNDP include in its framework of support the following:

- a. Continue the development of local capacities and encouraging continuing commitment by supporting relevant institutions sustain the training and capacity building started by the Project and initiate the conduct of a manpower requirement assessment vis-à-vis the long term energy goals and targets to ensure manpower availability during implementation.
- b. Continue further work to support updating and refinements of policy, planning, certification, testing, overall RE/EE/CDM manpower requirement assessment vis-à-vis long-term energy objectives and monitoring for results to build upon the remarkable progress and accomplishments made during the Project duration through inter-agency committees established by the projects; networking of R&D Centers, academic institutions and pertinent government agencies; round table discussions; and pooling of resources towards common goals.
- c. Continue to focus on the national level of impact given the momentum and growth initiated by the Project and the very positive response by the GoC, the private sector and local government units.
- d. Continue technology development and delivery and improvement for efficiency, reliability, and modernization the RE technology and financing mechanisms to bring down further the cost of acquisition and operation.
- e. Continue to support scaling-up activities and leveraging inputs, considering the results of pilot demonstration on cost, benefit, remaining barriers and challenges and effective dissemination of best practices and lessons learned from the project experiences and establish a quality assurance system to improve on the efficiency of the sub-contracting process.
- f. Continue to support the realization of the outcome in the remaining part of the Programme Cycle 2006 – 2010 and coming next cycle and the dissemination of outcomes and results of efforts achieved so far to broader range of reach.

6.2. Proposed Continuing Cooperation and Coordination among Partners and Projects in Meeting National Development Goals

In this regard, the Team likewise recommends that UNDP consider to:

- a. Continue to identify, develop and support follow-through projects that build upon the highly beneficial gains and outcomes in the projects included in this Outcome Evaluation and in the other related projects, in synergy with China's country-level interventions to institutionalize the systems and best practices as well as innovate from lessons learned through broad-based public/private sector participation in national policy dialogues.
- b. Spearhead, coordinate and support a RE/EE/CDM Partners' Caucus or **Round Table Discussion** that could be held twice a year, i.e. mid-year for reviewing the partnership progress in China's RE/EE projects and year-end for reviewing the whole year and planning for the next year, on a rotating hosting arrangement to promote an informed and unified approach in the project initiatives for China's MDGs in order to motivate sharing of financial inputs, direct sharing of information, identifying synergies and harmonizing directions towards common goals for China.
- c. Look at how a sustainable demand for energy consulting services can be maintained and at the same time develop attractive financial and institutional structures to address the energy manpower problem and conduct a manpower requirement study for RE/EE/CDM to support long-term energy goals.
- d. Support China in taking its proper posture in Programmatic CDM (p-CDM) approach in international conventions and national programmes.
- e. Support the conduct of a manpower requirement assessment in the RE/EE/CDM fields as implied by the ambitious targets in the long-term energy development goals of China.
- f. Support the establishment of a quality assurance system covering the entire cycle and value chain for improving effectiveness and efficiency in the project sub-contracting and outsourcing of consultancy services to minimize delays and meet project expectations.

ANNEXES

- A Outcome Evaluation Terms of Reference
- B Documents, Publications and other Materials Reviewed
- C List of Persons Interviewed/Consulted
- D UNDP China Outcome Evaluation Program of Activities
- E Project Performance Matrices – Project Output/Outcome Link

See attachment.

Annex B	Documents, Publications and other Materials Reviewed
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Date	Title of Document, Report or Publication
	GENERAL INFORMATION
Aug. 2005	Country Programme Document 2006-2010
March 2005	United Nations Development Assistance Framework 2006 -2010
June 2007	China's National climate Change Programme, National Development and Reform Commission
May 2003	Energy and Environment Outcome Evaluation Report, UNDP China, by Gareth Porter, Shi Han and Zhao Shidong
2002	Guidelines for Outcome Evaluators, UNDP Evaluation Office
2002	Handbook on Monitoring and Evaluating for Results, UNDP Evaluation Office
Dec. 2007	Results-Based Management at UNDP, UNDP Evaluation Office
March 2005	United Nations Development Assistance Framework for People's Republic of China
	SPECIFIC PROJECT DOCUMENTS
	a. RE Commercialization Project
March 1999	Project Document CPR/97/G31/A/1G/01: Capacity Building for the Rapid Commercialization of Renewable Energy in China
Sept. 2008	"Capacity Building for the Rapid Commercialization of Renewable Energy in China" Presentation PowerPoint
Dec. 2007	Final Evaluation Report: Capacity Building for the Rapid Commercialization of Renewable Energy in China by Jerome Weingart and Eugenia Katsigris
May 2001	Second annual Report for Capacity Building for the Rapid Commercialization of Renewable Energy in China
Dec. 2007	Second Year Semiannual Project Review: Capacity Building for the Rapid Commercialization of Renewable Energy in China, AG Meeting
	b. EUEE Project
Sept, 2008	China End Use Energy Efficiency Programme - A UNDP flagship project. PPT Presentation, Dr. Flora Kan
2003	GoC-UNDP/GEF, China End Use Energy Efficiency Project (PIMS # 2003)
2006, 2007, 2008	UNDP GEF Annual Project Report/Project Implementation Review, EUEE Project
April 2007, Sep. 2008	Annual Targets - China: End Use Energy Efficiency Project (Phase 1)
Jan 2007	EUEEP 2006 Annual Report, EUEEP Project Management Office
Dec 2007	EUEEP 2007 Annual Summary Report, EUEEP Project Management Office
2006, 2007, 2008	EUEEP Annual Work Plan 2006, EUEEP Project Management Office
2005, 2006, 2007 and 2008	EUEEP Quarter Operation Reports
	All TORs for EUEE Projects
	All Research Reports prepared for EUEE Projects
	Project Management Measures. EUEEP
	c. Efficient Refrigerators Project
2008	Barrier Removal for the Widespread Commercialization of Energy-efficient CFC-Free Refrigerators in China APR/PIR
November 2006	Refrigerator Project. Final Evaluation Report, David Von Hippel and Wang Lei
	Barrier Removal for the Widespread Commercialization of Energy-efficient CFC-Free Refrigerators in China, FECO/SEPA
	d. TVE – Phase II Project

June 2007	Energy Conservation and GHG Emissions Reduction in Chinese Township and Village Enterprises – Phase II, Final Independent Evaluation, Frank Pool, Wen Gang,
August 2005	Energy Conservation and GHG Emissions Reduction in Chinese Township and Village Enterprises – Phase II, Phase II Mid-Term Evaluation, Frank Pool, Wen Gang,
2003, 2004, 2005, 2006, 2007	UNDP GEF Annual Project Report/Project Implementation Review
December 2006	TVE-II, Evaluation of the RCF Mechanism, FINAL REPORT, HuiWenHua
January 2007	TVE-II – Project Impact Evaluation, Comprehensive Report, Department of Environmental Economics and Management, Renmin University of China,
	UNDP: Energy Conservation and GHG Emissions Reduction in Chinese TVEs – Phase II
August 2008	PPT Presentation, Introduction to China TVEs Project, PMO,
	Case Study, The Implementation of TVE Project by Xinjin County Yongxing Shale Hollow Brick Plant in Sichuan Province
	UNDP/GEF “Energy Conservation and Greenhouse Gas Emissions Reduction in Chinese Township and Village Enterprises – Phase II”, Project Profile
	e. CDM Capacity Building Project
	“Building Capacity for the Clean Development Mechanism (CDM) in China” Inception Report
	“Building Capacity for the Clean Development Mechanism (CDM) in China” Evaluation Final Report
	“Building Capacity for the Clean Development Mechanism (CDM) in China” Outputs Compile Report
	f. MDG Carbon Facility Project
Aug 2006	Project Document: MDG Carbon: Carbon Finance for Achieving MDGs in China
Jan. 2008	Project Annual Report: Project Document: MDG Carbon: Carbon Finance for Achieving MDGs in China
Sept. 2008	Strategic Framework for China’s MDG Carbon Market (Draft) by IT Power
Feb., May, Nov. 2007	Newsletters. MDG Carbon – Carbon Finance for Achieving MDGs in China
	g. FCB – II Project
April 2007	Project Document PIMS 2933: Demonstration for Fuel-Cell Bus Commercialization in China (Phase II)
June 2008	UNDP/GEF Annual Project Report/Project Implementation Review 2008
Sept. 2008	Briefing Material PPT Presentation: Demonstration for Fuel-Cell Bus Commercialization in china (Phase II) by Wang Ju, PMO

Annex C	List of Persons Met/Interviewed/Consulted
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Name	Position/Organization
	UNDP China Country Office
Subinay Nandy	Country Director, UNDP China
Andrea De Angelis	Advisor on Climate Change, UNDP China
Kishan Khoday	Assistant Resident Representative, Team Leader energy and Environment Team, UNDP China
Shijun Liu	Programme Manager, Energy and Environment Team
Ma Qi	Programme Manager, Energy and Environment Team, Natural Resources
Zhang Yu	Programme Associate on Climate Change
	CICETE
Xiang Yingling	Deputy Director Division II, China International Center for Economic and Technical Exchanges, Ministry of Commerce
	RE Commercialization Project
Mr. Luo Gaolai	PMO Deputy Director China State Environment Protection Agency (SEPA)
	EUEE Project
Mr. Gao Jian	Deputy Division Chief, Department of Resource Conservation and Environmental Protection, NDRC
Ms. Yu Cong	Director, EUEEP Management Office
Ms. Flora Kan	International Chief Technical Advisor, EUEEP Management Office
Mr. Li Yu Qi	National Chief Technical Advisor, EUEEP Management Office
Mr. Xin Sheng	Project Manager, EUEEP Management Office
	Efficient Refrigerators Project
Ms. Liu Yuan	Deputy Division Chief, Foreign Economic Cooperation Office, MEP
Mr. Liu Wei	Program Officer, Foreign Economic Cooperation Office, MEP
Mr. Zhong Shunhe	Senior Engineer, China Household Electric Appliances Research Institute
	TVE – Phase II Project
Ms. Wang Guiling	Executive Deputy Director, MOA/UNDP/GEF Project Management Office for Science and Technology Evaluation, MOST
Mr. Gao Shangbin	Deputy Director-General, Institute of Agro-Environmental Protection, MOA
Ms. Gao Shuang	Project Assistant, MOA/UNDP/GEF Project Management Office
Mr. Han Jun	Senior Engineer, Director of International Cooperation Division, National Center for Science and Technology Evaluation, MOST
Ms. Tracy Zhang	Research Assistant, National Center for Science and Technology Evaluation, MOST
Ms. Tao Rui	Research Assistant, National Center
	CDM Capacity Building Project
Ms. Li Liyan	Deputy Director Office of National Leading Group on Climate Change, NDRC
Mr. Song Yanqin	PMO Director CDM Capacity Building Project
	MDG Carbon Facility Project

Peng Sizhen	Director, Division of Global Environment, The Administrative Centre for China's Agenda 21, MOST
Lu Xuedu	Deputy Head and Alternate, CDM Executive Board of Kyoto Protocol, Office Global Environmental Affairs, MOST
Su Junxia	Program Officer, Division of Global Environment
Gao Xinquan	Program Officer, Division of Global Environment
	FCB – II Project
Wang Yu	Senior Engineer, GEF/UNDP/China Cooperation Project
Lun Jing Guang	Consultant, FCB – II Project
Yu Dan	PMO Staff
	Outcome Evaluation Consultants
Rogelio Z. Aldover	Team Leader and Independent Consultant on Energy, Environment and International Development
Xuejun Wang	National Consultant (Energy Efficiency), Peking University
Lv Fang	National Consultant (Renewable Energy), Beijing Jikedian Renewable Energy Development Center

Annex D

UNDP China Outcome Evaluation Program of Activities Beijing, China 11 Sep - 15 Oct 2008

Friday 12 Sep		
15:00-16:00	Evaluation Team Briefing to UNDP Senior Management	Subinay Nandy Kishan Khoday, Rogelio Z. Aldover, Xuejun Wang, Lv Fang, Shijun Liu, Xiang Yingling, Zhang Yu
Tuesday 16 Sep		
14:00 – 17:00	Meeting With EUEEP PMO	Rogelio Z. Aldover, Xuejun Wang, Shijun Liu, Xiang Yingling, Zhang Yu
Thursday 18 Sep		
14:00 – 17:30	Meeting with MDG-Carbon PMO (702 meeting room)	Rogelio Z. Aldover , Shijun Liu, Zhang Yu
Friday 19 Sep		
9:30 – 11:00	Meeting with Renewable Energy PMO (Wuhua Dasha A,2107)	Rogelio Z. Aldover , Lv Fang, Zhang Yu
14:00 - 16:00	Meeting with TVE-II PMO , Tongguang dasha. 9001	Rogelio Z. Aldover, Xuejun Wang, Zhang Yu
18:00 – 19:00	Coordination Meeting of the Evaluation Team	Rogelio Z. Aldover, Xuejun Wang, Lv Fang
Monday 22 Sep		
14:00 – 17:00	Meeting with FCB-II PMO	Rogelio Z. Aldover, Xuejun Wang, Zhang Yu
Tuesday 23 Sep		
14:00- 16:30	Meeting with Refrigerator PMO	Rogelio Z. Aldover, Xuejun Wang, Zhang Yu
17:30-19:30	Meeting with CDM PMO Guohong Dasha (B-1913) Mr. Song Yanqin and representative from NDRC	Rogelio Z. Aldover Lv Fang, Zhang Yu
Wed - Thurs 24 – 25 Sep		
	Additional Data Gathering and Drafting of Evaluation Report by Project	Rogelio Z. Aldover, Xuejun Wang, Lv Fang
Friday 26 Sep		
9:00	Coordination Meeting of the Evaluation Team	Rogelio Z. Aldover, Xuejun Wang, Lv Fang
Sat 27 Sep – Thurs 2 Oct		
	Additional Data Gathering and Drafting of Evaluation Report by Project	Rogelio Z. Aldover, Xuejun Wang, Lv Fang
Friday 3 Oct		
9:00	Coordination Meeting of the Evaluation Team	Rogelio Z. Aldover, Xuejun Wang, Lv Fang
Friday 3 Oct		
	Final Drafting of Outcome Evaluation Report by the Evaluation Team	Rogelio Z. Aldover, Xuejun Wang, Lv Fang
Monday 6 Oct		
	Submission of Outcome Evaluation Report by the Evaluation Team	Rogelio Z. Aldover, Xuejun Wang, Lv Fang
Wednesday 8 Oct		

14:00 – 16:00	Debriefing on the Initial Results of Outcome Evaluation by the Evaluation Team for UNDP China and Comments/Suggestions on the Plan for Finalizing the Outcome Evaluation Report	Kishan Khoday, ,Shijun Liu, Andrea de Angelis, Ma Qi, Zhang Yu, Rogelio Z. Aldover, Xuejun Wang, Lv Fang
Thursday 9 Oct		
	End of In-country Evaluation Mission	Rogelio Z. Aldover, Xuejun Wang, Lv Fang
Fri 10 – Tues 14 Oct		
	Incorporation of all Comments/Suggestions on and Final Editing of the Outcome Evaluation Report by the Evaluation Team	Rogelio Z. Aldover, Xuejun Wang, Lv Fang
Wednesday 15 Oct		
	Submission of Outcome Evaluation Report by the Evaluation Team to UNDP China	Rogelio Z. Aldover, Xuejun Wang, Lv Fang, Shijun Liu

Annex E	Project Performance Matrices – Project Output/Outcome Link
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1. Capacity Building for the Rapid Commercialization of Renewable Energy in China (CPR/97/G31)

Project Strategies	Success indicators	Actual Progress/ Accomplishment as of Sept 2008	Assessment of Impact/Outcome ¹
a. Goal			
Expand RE commercial and industrial capability and RE sustainable development capacity	Market-based incentive instruments is established	<ul style="list-style-type: none"> - China RE Law came into force, 10+ regulations afterwards released in Jan. 2006. - China RE Medium- and Long-term Planning, targets identified in Sept. 2007. - White Book on Energy Situation and Policy, RE identified as significant part in Dec. 2007 - Secretary General of UN highly appraised the efforts China did on RE development during the Bali Climate Change summit in Dec. 2007, 	Highly Satisfactory
b. Purpose			
Development of national capacity for the rapid commercialization of RE in China. Removal of barriers to four promising RE technologies	<ul style="list-style-type: none"> Extensive attentions paid RE market quickly expanded Investment substantially increased RE Industry fast propelled Positive international responses 	As of end of 2007: <ul style="list-style-type: none"> - Wind: accumulative capacity 6GW (> 2010 target) - Solar PV: manufacturing capacity 1GW, 2nd in the world - Solar water heater: annual production 23 mil m2, accumulated 130 mil m2, 60% of the world - Biomass: 22 mil household biogas, 3000 large biogas, total volume 10 billion m3 	Highly Satisfactory
c. Outcomes			
Assist in the development and implementation of national RE law, policy, strategy and plan	Policy framework and legislation assisted in China	<ul style="list-style-type: none"> - Assisted in the following legislations and documentation: - Renewable Energy Law - RE legislation and policy advice - Biogas National Action Plan (NAP) - Wind concessions program - Guideline for RE Village Power - Developed Standards for Solar Water heater industry: - Guidelines of Light Industry Biogas Project - Guidebook of Livestock and Poultry Farm Biogas Project - Strategy of Middle/Large Scale Biogas Industry Development 	Highly Satisfactory
Institutional	Industry association	- The Chinese Renewable Energy	Satisfactory

¹ Ratings. **Highly Satisfactory** - Project achieved fully or exceeded its objective. The project can be presented as "good practice." **Satisfactory** - Project achieved mostly its objective. **Marginally Satisfactory** - Project achieved partially its objective. **Unsatisfactory** - Project did not achieve its objective.

development	established	Industries Association (CREIA) has had a direct impact on the commercialization achievements of the Project, and serves as the clearinghouse for information on the RE industry in China including standards, technology development, market information, investment opportunities, policy, and training.	
Accelerated RE Technology Commercialization	RE related technologies successfully promoted and commercialized in China	<ul style="list-style-type: none"> - Commercial systems approaches in large-scale biogas - Combined hardware and training support for wind site characterization - Commercial approaches for village hybrid power systems and rural energy services concepts - Capacity building in testing and certification of SWH 	Satisfactory
Demonstration Projects	Pilot projects supported to demonstrate the costs, benefits, and applications of various renewable energy technologies with the goal of leveraging investment in larger scale projects	<ul style="list-style-type: none"> - Industrial-scale biogas pilots changed the paradigm of the biogas industry from one of environmental compliance to generating economic benefits and increased efficiency; - SWH testing and certification work created three national testing centers and one certification center, as well as the Golden Sun label, changing the structure and enhancing the quality of the SWH industry. - Wind resource assessment and site characterization efforts have resulted in Project standards become the new national resource assessment standards; - The five hybrid systems in Bulunkou Township have provided the government with a tangible example of alternative approaches to village electrification, especially as these systems are located in the same vicinity as SDDX systems. 	Satisfactory
Promotion and Dissemination	Knowledge and understanding of renewable energy by a broader range of stakeholders and the general public enhanced.	<ul style="list-style-type: none"> - Village Power Development Guidebook, employed by project developers in China and worldwide; - Baseline Survey of SDDX, which has been used by the Government to rethink the next phase of national electrification, SDDC; - The project development guidebook for biogas projects; - Many domestic and international workshops to conduct trainings, promote knowledge exchange, share the results and lessons learned of the Project, and engage government stakeholders in meaningful 	Highly Satisfactory

		<p>discussions;</p> <ul style="list-style-type: none"> - Publicity: TV, CD, books for public awareness. 	
Sustainability	Demonstration project sustained in economic, social/political and environmental/technical aspects	<ul style="list-style-type: none"> - In the field of industrial-scale biogas, multiple feedstock and somewhat centralized systems have been shown to be financially and economically viable. - In the SWH sector, the testing and certification standards have been developed and certification facility has been constructed through the Project. This will guide China solar water heater industry to be developed more healthily which will benefit not only China consumers but global customers as well. - Wind resource assessment and site characterization activities of the Project have significantly raised the awareness and technical skill in China to do wind resource assessment. The will be a solid foundation for wind industry development and its tremendous achievement are already appeared from rapidly growing installed capacity in wind farms in China for recent years. - For the village power sector, the capacity building efforts have focused on viable rural energy service delivery models for China. The lessons learned and recommendations generated by the Project are all geared toward ensuring the sustainability of the GOC's massive investment in RE hardware for rural areas. 	Highly Satisfactory

2. China End-Use Energy Efficiency Project (CPR/02/G32)

Project Strategies	Success indicators	Actual Progress/ Accomplishment as of Sept 2008*	Assessment of Impact/Outcome ²
a. Goal			
Annual growth rate of GHG emissions from SMIs reduced	Annual GHG emissions are reduced by 713,000 tons starting Year 5	- Emission reduction for 2007 and mid 2008 totaled 23 Mtonne CO ₂	Highly Satisfactory
b. Purpose			
Energy utilization efficiency in SMI significantly improved	Energy savings of 180,000 toe in SMI by Year 5	- Energy savings reported for 2007 and mid 2008 totaled 9.3 Mtce	Highly Satisfactory
c. Outcomes			
Competitiveness of SMIs increased	Ave energy cost per introduction in SMS reduced by 10-15% by Year 5	<ul style="list-style-type: none"> - Energy efficiency design standard for residential buildings in severe cold and cold zones revised and awaiting formal approval - Cement plant energy conservation design codes issued by MOC and AQSIQ, and came into force from May 1, 2008 - Cement plant energy conservation design codes issued by MOC and AQSIQ, and came into force from May 1, 2008 - Four industrial equipments and six commercial equipments approved and are undergoing formal publication process - Ongoing support for developing the standards (labeling) and design codes - Energy efficiency standards and Certification (labels) for major energy consuming industrial equipment and consumer appliances are being established 	Highly Satisfactory
Increased impact of existing policies as well as recently enacted ones	Timely development and implementation of policies to reduce GHG emissions by Year 3	<ul style="list-style-type: none"> - Support for the Revision and implementation of the Energy Conservation Law - Chongqing building energy conservation regulation issued - Quality control procedures established - Ability to support local governments in policy development and implementation increased 	Satisfactory
Enhances SMI and public awareness of EC and EE through information and reporting	Establishment and operation of info system	<ul style="list-style-type: none"> - Increased the awareness of 4 energy service organizations and 10 energy centers in the energy saving potentials of air compressors - External monitoring and evaluation expert group: proposal evaluation and acceptance of deliverables - Compulsory quarterly progress meeting by all sub-contractors - Scalable information dissemination platform developed: interactive website with daily information update - Improved efficiency in the collection and analysis of energy information: 	Satisfactory

² Ratings. **Highly Satisfactory** - Project achieved fully or exceeded its objective. The project can be presented as "good practice." **Satisfactory** - Project achieved mostly its objective. **Marginally Satisfactory** - Project achieved partially its objective. **Unsatisfactory** - Project did not achieve its objective.

		<p>Online energy information management system in Shanghai, Sichuan and Shandong</p> <ul style="list-style-type: none"> - Communication and outreach ability strengthened: substantially increased regular visits and useful information contents - Permanent exhibition on energy efficiency in Shanghai 	
Improved skills in EC and EE through capacity building	Establishment and operation of training system	<ul style="list-style-type: none"> - 1015 energy engineers from 4 motor system service organizations and 10 energy centers trained in energy optimization of fan, pump, motor, and air compressor systems - Six training material produced: motor system, industrial boiler and steam system, building and central air conditioning, industrial furnace, building heat insulation material and management and financial analysis - Over 360 trainees trained directly under contract, with over 2000 trainees trained in total - Training courses were held and were attended by senior government official and professional designers in building code implementation related regulations and systems 	Satisfactory
Fostering of energy service industry	Enhance commercial energy service companies	<ul style="list-style-type: none"> - Four motor system service organizations completed 40 plant assessments and developed 16 case studies (currently under preparation for publication) - Capacity of 8 energy centers strengthened substantially in China eastern area to strengthen their services to local industries - Energy auditing capability improved - over 100 energy audits conducted 	Highly Satisfactory
Increased financial system willingness to lend to SMIs for EE projects	Loan Guarantee fund by Year 2, Sustainable financing system by Year 5	<ul style="list-style-type: none"> - Hardware of 8 energy centers in the eastern provinces modernized through approximately US\$ 1 million local government co-financing leveraged by EUEEP project 	Satisfactory
Increased credibility of EC and EE through successful demo projects	Demo projects in Year 3, 250 SMI EE projects presented to banks for loans by Year 3	<ul style="list-style-type: none"> - Beijing: 207518.6 m2 low energy consumption and solar technology - Shanghai: 2000 m2 office building retrofitting - open for public visit - Shenzhen: Integrated building energy technologies demonstration building, including energy conservation, water conservation <p>Building energy conservation regulation implementation process management software developed and piloted in Chongqing</p>	Satisfactory

3. Barrier Removal for the Widespread Commercialization of Energy-Efficient CFC-Free Refrigerators in China (CPR/98/G31)

Project Strategies	Success indicators	Actual Progress/ Accomplishment as of Sept 2008	Assessment of Impact/Outcome ³
a. Goal			
Reduce CO ₂ and other greenhouse gas emissions in China	CO ₂ emissions reduced	- 170 million tons CO ₂ emissions avoided (1999-2005)	Highly Satisfactory
b. Purpose			
Promote the widespread commercialization of energy-efficient refrigerators	Production and sale of energy-efficient refrigerators	- A cumulative total of 39.58 million units of EE refrigerators were produced and sold from 2000 to 2005, for average annual sales of 8 million EE refrigerators.	Highly Satisfactory
c. Outcomes			
Develop capacity to provide a "technology push" for increasing the supply of energy efficient (EE) compressors	Capacity building through ways such as training, etc.	<ul style="list-style-type: none"> - Technical staff from 8 compressor manufacturers in China completed international design training workshops and study tours. - The average compressor COP efficiency has improved from 1.0 in 2000 to 1.46 in 2005. - Leading compressor manufacturers upgraded their energy-efficient compressor production and manufacturing capacity. The highest COP value of newly-developed model has risen now to 1.9 	Satisfactory
Develop capacity to provide a "technology push" for increasing the supply of energy efficient refrigerators	Capacity building through ways such as training, etc.	<ul style="list-style-type: none"> - Representatives from sixteen (16) refrigerator manufacturers were provided in-depth training abroad. - The 16 refrigerator prototypes addressed in the training were all improved to achieve EE refrigerator level equivalent European grade "A". 	Highly Satisfactory
Establish incentive framework to promote the design, production, consumer acceptance, and increased market sales of high-efficiency refrigerators and compressors	Energy efficiency standard, financial incentives, governmental procurement, etc.	<ul style="list-style-type: none"> - The implementation of new minimum efficiency standards and establishment of process for periodic revision of standards was started. - A system of financial incentives was established which has started awarding to manufacturers who undertake the design and production of energy-efficient refrigerators. - The Ministry of Finance and NDRC jointly issued "Government Procurement Notification on Energy Efficient Refrigerators" - The government implemented "Retailer Incentive Program". The sales data collection system was established to monitor the progress of the program. 	Satisfactory
Create market conditions of increased consumer demands for	through ways such as consumer	- Starting March 2005, the GoC has required the compulsory Energy Labeling to be adopted for all energy	Satisfactory

³ Ratings. **Highly Satisfactory** - Project achieved fully or exceeded its objective. The project can be presented as "good practice." **Satisfactory** - Project achieved mostly its objective. **Marginally Satisfactory** - Project achieved partially its objective. **Unsatisfactory** - Project did not achieve its objective.

energy efficient refrigerators	education, and increase capacity of sales force to promote energy-efficient refrigerator sales	<p>efficient refrigerator sales.</p> <ul style="list-style-type: none"> - A broad range of public educational, market, and promotional campaigns were conducted. The advertising campaign obtained the famous international advertisement award known as the "EFFIE Award". - The Project conducted activities that increased the capacity in retail channels to understand and promote the sale of energy-efficient refrigerators through the "Retailer Education Campaign" for training of retail staff at 56 key marketing units in Beijing, Shanghai, Guangzhou, Xian and Wuhan. 	
Establish national capacity to promote and manage energy efficiency in the refrigeration sector	Information system, testing center construction.	<ul style="list-style-type: none"> - The Information Center established by the Project completed collection of initial project results for 2000-2005 for dissemination to the public. - A Testing Center was also established to support the monitoring and evaluation system established for the Project in order to track on project progress and refrigerator sub-sector development. - More than 150 groups of sample refrigerators have been tested and results published for the program. 	Satisfactory

4. Energy Conservation and GHG Emissions Reduction in Chinese Township and Village Enterprises (TVE) – Phase II (CPR/99/G31)

Project Strategies	Success indicators	Actual Progress/ Accomplishment as of Sept 2008	Assessment of Impact/Outcome ⁴
a. Goal			
Reduce CO ₂ and other greenhouse gas emissions in China	CO ₂ emissions reduced	<ul style="list-style-type: none"> - In the eight pilot-demonstration projects implemented, GHG savings of 193,192 tons CO₂/yr have been achieved - 111 out of 118 formal replication projects, with CO₂ reductions of 1.3 million tons/yr are achieved or underway (with 714,000 tons/yr CO₂ savings in 101 projects implemented to date) 	Highly Satisfactory
b. Purpose			
Energy utilization efficiency is improved	Number of TVEs involved in technical renovation and efficiency improvement. Energy savings gained.	<ul style="list-style-type: none"> - Technical renovations and efficiency improvement projects have been accomplished in 8 pilot TVEs and 101 replication TVEs which have resulted to actual EE project implementation in TVEs. - The project initiatives have been generating energy savings of 373,000 tce per annum 	Highly Satisfactory
c. Outcomes			
creating institutional mechanisms for barrier removal at the national, county and enterprise levels	Institutional mechanisms created at different levels	<ul style="list-style-type: none"> - The policy and institutional infrastructures and mechanisms for the adoption of energy-efficient technologies in the TVEs have been created. - Based on the technical progress achieved in the demonstrations supported by the TVE Phase II Project, the local governments have fully supported and promoted the enforcement of a national policy encouraging use of hollow bricks. - The continuing progress has led to the development and adoption of technical standards in the production of the hollow bricks. - During the project implementation, the Hong Yuan Company, a commercially focused support unit, has been developed. 	Satisfactory
Building technical capacity for energy efficiency and product quality improvement in TVEs	Technical renovation. The application of new technologies, etc.	<ul style="list-style-type: none"> - Significant technical capacity for energy efficiency has been started to be built in the PMO, government agencies involved and the TVEs. 	Highly Satisfactory

⁴ Ratings. **Highly Satisfactory** - Project achieved fully or exceeded its objective. The project can be presented as "good practice." **Satisfactory** - Project achieved mostly its objective. **Marginally Satisfactory** - Project achieved partially its objective. **Unsatisfactory** - Project did not achieve its objective.

		<ul style="list-style-type: none"> - Technical renovations in two (2) brick-making pilot TVEs and 60 brick-making replication TVEs were completed. - The energy-efficient tri-arch Hoffman kiln technology has been successfully applied in brick-making in involved TVEs. This practice as initiated by the TVE – Phase II Project also helped in putting up a national standard for hollow bricks, i.e. the JC982-2005 standard. - The successful construction and operation of the first waste heat power generation plant ever applied on a 5-stage pre-heater NDP cement line in China have promoted the issue of a incentive policy by Zhejiang government to encourage the apply waste heat power generation technology onto NDP cement lines - The technology has been brought in to the national program by the NDRC. - The “Clean Type” coking oven plus the waste heat power generation technology has designated as a key national technical renovation project, and ranked key promotion technology in coking sub-sector by Shanxi provincial government. - Besides 118 replication TVEs directly supported by the project, representatives from about 400 additional enterprises have visited the project pilot TVEs to learn their EE technology. 	
creating special access to commercial financing for TVEs in industries to undertake energy conservation and GHG emission reduction activities	Creation of financial mechanisms for technical renovation in TVEs	<ul style="list-style-type: none"> - The Revolving Capital fund (RCF) has been playing a significant role in financing technical renovation projects in the four sectors selected in TVEs. - The progress and encouragement have been revealing and the trends in effectiveness is hoped to be increasing steadily. 	Satisfactory
Expanding the application of best practices for local regulatory reform to the national level	Successfully introducing new mechanisms such as VAs to TVEs	<ul style="list-style-type: none"> - The project takes a lead in introducing Voluntary Agreement (VA) into TVEs. 	Satisfactory

5. Building Capacity for the Clean Development Mechanism (CDM) in China (CPR/01/002 (CPR/02/H02))

Project Strategies	Success indicators	Actual Progress/ Accomplishment as of Sept 2008	Assessment of Impact/Outcome ⁵
a. Goal			
China sustainable development objectives are met through improving capacity for implementing effective CDM projects.	CDM market quickly expanded and CDM Industry fast propelled	<ul style="list-style-type: none"> - By the end of 2006, 255 CDM projects are approved by Chinese government, and 36 registration approved by EB - BY 2007, China also accounts for 25% of the projects registered in worldwide CDM market. 	Highly Satisfactory
b. Purpose			
China CDM development pushed by capacity building	Policy research, training, pilot and dissemination achieved	<ul style="list-style-type: none"> - Policies, human resources, and information dissemination base is established by project implementation. 	Highly Satisfactory
c. Outcomes			
Policy component	Policy component assisted the Chinese government in formulating its regulations relating to CDM	<ul style="list-style-type: none"> - Several of the key recommendations have been accepted and included in the Measures for Operation and Management of Clean Development Mechanism Projects in China - The arrangement for the sharing of CERs revenues between the enterprise implementing the CDM project and the Chinese government. A particular feature of this arrangement is that the Chinese government collect a levy on the revenues from the sale of CERs, with the levy dependent on the type of project; - Clarification and explanation of the concept of sustainable development in the context of CDM; - Formulation of the eligibility criteria for enterprises wishing to participate in CDM. This includes, among others, the requirement of majority ownership by China; in other words, WFOEs (Wholly Foreign Owned Enterprises) and joint ventures with a majority share held by foreign companies are excluded. 	Satisfactory
Training component	Training component achieved in advancing the CDM capacity building program	<ul style="list-style-type: none"> - The training component was key in creating awareness on CDM, and triggering the idea among project owners and consultants to become active in the field of CDM. - 8 training courses and 800 trainees in the project, and most of the trainees are active in China CDM market development. - CDM Training industry in China was developed based this project with the trainers, training materials. 	Highly Satisfactory
Pilot demonstrations	Pilot demonstrations component initiated a number	<ul style="list-style-type: none"> - It helped to prove that CDM was 'real' and that has triggered an impressive number of follow-up projects. - The Huitengxile wind farm was 	Satisfactory

⁵ Ratings. **Highly Satisfactory** - Project achieved fully or exceeded its objective. The project can be presented as "good practice." **Satisfactory** - Project achieved mostly its objective. **Marginally Satisfactory** - Project achieved partially its objective. **Unsatisfactory** - Project did not achieve its objective.

	of key 'early CDM projects' in China	<p>registered with the EB of the UNFCCC on 26 June 2005. It was the <u>first</u> registered CDM project from China, and the <u>first</u> registered wind farm project in the world.</p> <ul style="list-style-type: none"> - The pilot has triggered an impressive follow-up, with 43 registered CDM wind farm projects in China per the middle of September 2007. Almost no Chinese wind farm projects are currently developed without the help of CDM. - The Taishan Huafeng Cement Works Waste Heat Recovery and Utilization for Power Generation Project was registered with the EB of the UNFCCC on 24 June 2006. It is the <u>first</u> registered energy efficiency CDM project from China, and also formed the <u>basis</u> for an approved methodology, AM0024. It triggered a considerable number of follow-up projects, most of which are in the validation stage and use consolidated methodologies (ACM0004 and its successor ACM0012) rather than AM0024. - The Nanjing Tianjingwa Landfill Utilization Project was registered with the EB of the UNFCCC on 18 December 2005. It was the <u>first</u> registered Chinese landfill gas CDM project, and the first Chinese CDM project to obtain CERs. The project was followed with the registration of 4 more Chinese landfill gas projects, and a total of 25 additional Chinese landfill gas capture projects have been submitted for validation. - The Huainan Pansan Coal Mine Methane Utilization and Destruction Project was registered with the EB of the UNFCCC on 31 March 2007. It is one of the first projects that submitted methane baseline methodology and monitoring methodology in the world, and the second CMM/CBM project from China registered with the EB of the UNFCCC. A total of 54 other projects using CMM/CBM projects have been submitted for validation, of which 52 are located in China 	
Dissemination component	Disseminated CDM information and project progress as information channel on CDM in China	<ul style="list-style-type: none"> - Dissemination component supported the development of a website that is considered the key official bilingual information dissemination channel on CDM in China - The website is very frequently consulted for information on CDM regulations and CDM project approvals, new methodologies, and for information on potential CER buyers <p>The number of hits per 13 March 2006 was 142,000; whereas per end 2006, the Chinese website had received 200,000 hits and the English website 20,000 hits. At http://CDM.ccchina.gov.cn</p>	Satisfactory

6. China Millennium Development Goals (MDG) Carbon Facility (CPR/06/305)

Project Strategies	Success indicators	Actual Progress/ Accomplishment as of Sept 2008	Assessment of Impact/Outcome ⁶
a. Goal			
Poverty and environment solutions for the MDG delivery strategy	GHG reduced in projects assisted through the facility	- To date, 108 PINs and 29 PDDs in 12 pilot provinces have been developed	Satisfactory
b. Purpose			
Develop CDM capacity for MDG benefits especially those areas needing assistance	Necessary CDM capacity in relevant sectors and areas created, from all major aspects, including project formulation, access to international CDM financing and implementation support	- Continuing capacity development of 1700 participants	Satisfactory
c. Outcomes			
Strategic Planning Framework for MDG-Carbon Programmes on CDM	Strategic planning framework for MDG-Carbon programmes on CDM developed and disseminated	- A strategic planning framework for MDG-Carbon Programmes on CDM has been drafted, project development and implementation support for PINs and PDDs portfolio meeting MDG identified	Satisfactory
Project development and implementation support	Provided participants with three different options for utilizing offsets provided by the Kyoto MDG-Carbon portfolio and the voluntary MDG-Carbon portfolio	- To date, 108 PINs and 29 PDDs in 12 pilot provinces have been developed; - continuing capacity development of 1700 participants; - established the website and database; and - Continuing promotion and information dissemination.	Satisfactory
Climate exchange through public-private partnerships	MDG-Carbon Data desk established	- establishment of a Climate Exchange through public-private partnerships ongoing	Satisfactory
	Carbon Investor guidebook published and updated	- Ongoing	Satisfactory
	Private sector database established and updated	- Ongoing	Satisfactory

⁶ Ratings. **Highly Satisfactory** - Project achieved fully or exceeded its objective. The project can be presented as "good practice." **Satisfactory** - Project achieved mostly its objective. **Marginally Satisfactory** - Project achieved partially its objective. **Unsatisfactory** - Project did not achieve its objective.

7. Demonstration for Fuel-Cell Bus Commercialization in China – Phase II (CPR/07/G36)

Project Strategies	Success indicators	Actual Progress/ Accomplishment as of Sept 2008	Assessment of Impact/Outcome ⁷
a. Goal			
GHG emissions reduction through use of FCBs	GHG reduced in tons CO ₂ equivalent	Estimate of GHG reduction being made	Satisfactory
b. Purpose			
Demonstration of operational viability of FCBs and their refueling infrastructure in China	FCB and refueling infrastructure demonstrated and data gathered and analysis done	On going	Satisfactory
c. Outcomes			
1. Demonstrate operational viability			
FCB acquired	3 FCBs for Beijing procured	The three (3) Beijing FCBs acquired in Phase 1 have been operated and had a total distance traveled at 18,000 km.	Satisfactory
Hydrogen refueling	Hydrogen refueling station built	The Shanghai refilling station was built and put into service in 2007.	Satisfactory
FCB workshop and garage	FCB workshop and garage built	FCB workshop and garage built	Satisfactory
2. Accumulate Knowledge and information			
Data collection system	Data collection system design completed	Phase 1 3 buses purchased and feasibility study prepared to gather more information at the same china support to develop a local design in a different design using the hybrid expected to be better to use pure. The Chinese design has taken 3 generations of FCB design. The application model, original to be 6 but the funding was not enough, the Chinese government funded 3 units using hybrid. UNDP project only china was successful to get sufficient data among the five countries doing same FCB demonstration including India, Mexico, Brazil and Egypt. The official website for the project has been constructed to enhance promotion and information exchange.	Satisfactory
Study tours	Study tour conducted		Satisfactory
Staff training	No. of staff trained	Support of local city government for the financial requirements of the units and operating cost has been very helpful in advancing the technical and policy-related studies for the FCB application and possible commercialization in the years to come	Satisfactory

⁷ Ratings. **Highly Satisfactory** - Project achieved fully or exceeded its objective. The project can be presented as "good practice." **Satisfactory** - Project achieved mostly its objective. **Marginally Satisfactory** - Project achieved partially its objective. **Unsatisfactory** - Project did not achieve its objective.

3. Promote enabling environment			
Ridership survey	Ridership survey conducted and analyzed	Ongoing	Satisfactory
Newsletter, reports and workshops	11 newsletter and various reports submitted and workshops conducted.	The Project has continuously conducted public awareness through workshops, coordination meetings and media coverage.	Satisfactory