ESMAP

Joint UNDP / World Bank Energy Sector Management Assistance Programme

CHINA AND VIETNAM
PROJECT EVALUATION

by the
ESMAP Technical Advisory Group (TAG)

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with
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INTRODUCTION

The ESMAP Technical Advisory Group (TAG) provides policy guidance to ESMAP in its choice and execution of projects in the developing world. The TAG also reports to the ESMAP donors, providing them with a mechanism for oversight and dialogue with ESMAP management.

At the ESMAP/TAG meeting on 15 November 1994 it was decided that TAG members would each carry out in-country reviews of two or three ESMAP projects within their own area of special interest. It was also agreed that the TAG members would work with consultants who would be appointed to support these reviews.

The details and logistics of these reviews were discussed at subsequent meetings. It was decided that TAG member Gerald Leach would be responsible for the evaluation of a number of ESMAP activities in Vietnam and China. Draft Terms of Reference (ToR) were prepared by ESMAP, discussed with Gerald Leach in late 1995 and agreed in February 1996. The final ToR are attached as Annex A to this report. Gerald Foley of the Nordic Consulting Group was appointed as consultant.

The evaluation mission departed from London for Vietnam on 23 February 1996 travelling on to Beijing on 29 February and returning to London on 7 March 1996. This report presents its findings and is divided into three sections.

Section 1 presents a short overview of ESMAP's performance in relation to the projects reviewed. It also highlights a few general points of broad relevance to ESMAP activities in the rural and household energy sector which, the mission believes, demand the attention of ESMAP's management and donors.

Sections 2 and 3 deal respectively with reviews of the projects in Vietnam and China, in both cases giving a detailed and itemised response to the ToR.

ACKNOWLEDGEMENTS

The members of the mission would like to take this opportunity to thank the many people in Viet Nam and China whom they interviewed for their time and patience and in some cases, most generous hospitality. Some members of ESMAP also deserve our thanks for providing documents and other help in support of the mission.
1. OVERVIEW

The TAG review mission took place in two very different countries. Nevertheless, it found significant similarities between, and common lessons to be learned from, the ESMAP projects which it investigated. This section provides a brief summary of these findings and also draws together some general points about the activities of ESMAP which its management and donors might like to consider.

Vietnam

Working in Vietnam has posed a number of problems for ESMAP which are related to the insecurities and cultural changes resulting from the transition away from a command economy. Data have been extremely difficult to obtain. Working methods have had to be tailored to the conditions existing in Vietnam as it goes through the difficult process of adapting to a market economy.

The project on "Rural and Household Energy Issues and Options" filled a major information gap. In this activity, ESMAP utilised its own well-developed skills in preparing a framework for further analysis of issues in the rural and household energy sector. In addition, it raised a number of issues, including domestic electricity use and the need for a more coherent approach to rural electrification, which have been adopted into the mainstream of policy-making in the electricity sector. The project was, however, very weak in its treatment of fuelwood and forestry issues.

The "Improved Coal Briquetting and Stove" project is a response to two of the issues identified in the Issues and Options study. It is a practical, competent, and relevant proposal for a substantial investment activity which, in the view of the TAG mission, deserves to be funded. The other ESMAP activity in Viet Nam, the Power Sector Reform and Restructuring project, was outside the ToR of the mission. It also appears to have been relevant and effectively carried out.

Both these projects scored well in terms of timeliness, contribution to policy development, and product quality (except for the treatment of fuelwood and forestry issues noted above). Both projects involved a good level of cooperation with local counterparts. The first project mentioned above also involved considerable capacity building and transfer of skills. The second project is likely to do the same if the follow-up activity which it proposes is funded. Neither project could be said to meet current government priorities for the energy sector, but this is only because these are focused so strongly on the power sector. Both projects, however, have done much to raise local awareness about important energy issues and related social and environmental concerns which arguably should have a higher profile in future discussions on energy in Viet Nam.

The mission found that neither project raised much interest in the local World Bank office, in which attention was largely focused on the power sector (and ESMAP's highly-regarded project in this area). Responses from the key project and/or ESMAP donors - Sweden/SIDA and UNDP were mixed.
China
In China, a number of linked ESMAP activities have clearly had a major and beneficial impact on the Chinese approach to integrated rural energy planning. The TAG mission reviewed three components of this set of projects: (1) the initial activity on "Rural and Household Energy" planning which led to the other projects; (2) a project on improved "Planning and Management of Decentralized Power Companies" and (3) a project on "Energy Conservation and Pollution Control in Township and Village Enterprises".

Generally speaking, all three projects have involved (or are likely with follow-up funding to lead to) the effective transfer of expertise and skills to substantial numbers of Chinese personnel. The first project in particular was most influential in teaching Chinese experts and officials about the design and implementation of energy surveys and methods of analysis. ESMAP also introduced a number of important concepts such as least-cost analysis and cost-benefit analysis into rural energy planning. These have been adopted and integrated into huge Chinese initiatives such as the current and expanding Hundred Counties Programme on rural energy planning and development. In these crucial respects the ESMAP initiatives have certainly been fully justified.

In summary, all three projects score highly for timeliness and relevance, for being client-driven (with some qualifications over the decentralized power companies project) and for capacity building and contribution to policy development and reform. However, none of the projects scored well in terms of relevance to the operating region of the Bank (which is pre-occupied elsewhere, with massive lending programmes in the power and fossil fuel sectors). The mission did not pursue the question of relevance to donor activities since all these projects were funded by ESMAP's own core funds. The views of UNDP were very mixed, ranging from strong enthusiasm for the TVE project to complaints that the other projects had done little or nothing to keep UNDP in touch.

The mission judged the quality of the projects and their products to be very high in the case of the TVE project, high for the rural energy work - with the major exception of its weak and misleading analysis of fuelwood projects (as in Vietnam) - and moderate for the project on decentralized power companies.

The problem of weak fuelwood methodologies is especially important in China as it concerns an area of activity in which the Chinese government has expressed particular interest. This concern can, however, be mitigated by appropriate revisions to the December 1995 draft (green cover) ESMAP report on "Energy for Rural Development in China" which is currently being prepared for final publication.

General comments
On the whole, ESMAP comes through this review with flying colours. In the mission's opinion, most of the projects reviewed score well, or fairly well, in most important respects. As might be expected for such a wide range of activities in such varied circumstances, the mission also found a number of specific failings and weaknesses. Some of these are noted above; others are discussed in Sections 2 and 3 below.
More importantly, the mission also formed the view that there are some generic weaknesses which are common to many of the activities or products it reviewed. It believes that these warrant careful attention by ESMAP management, staff and donors. In a spirit of constructive criticism, three key issues are singled out below.

**Need for a coherent strategy (or strategies)**
The mission was struck by the fact that there did not appear to be any strategic pattern in ESMAP's activities. These appear to be relatively arbitrary rather than part of a programme coherently related to the resources likely to be available to ESMAP. Nor in the activities carried out did there seem to be any significant degree of integration between ESMAP activities and those of the mainstream World Bank programmes. Nor, indeed, with a couple of notable exceptions, was there any significant coordination with UNDP or other donor agencies.

For example in China, with the exception of the TVE programme, opportunities for integrating ESMAP projects with the major projects being funded by the Bank or other agencies, or piggy-backing on some of them, do not appear to have been adequately investigated. With a Bank lending programme of $3 billion per year of which $800 million is in energy, there would appear to be a substantial potential for such interaction with ESMAP.

The mission feels that ESMAP should give considerable thought to this issue and examine where its own comparative advantage lies. Given its widely accepted position as a provider of overviews and syntheses, it might, for example, attempt to pull together the various threads of the fuelwood and forestry discussion in Vietnam which is presently fragmented between a variety of external agencies. It might attempt similar exercises for small scale hydro or other aspects of rural electrification and rural energy. There must be a substantial set of such topics in which ESMAP skills and experience could be well-matched to the relative lack of information about energy matters amongst other Bank divisions and operating arms and other donors.

**Better follow-up and quality control**
The mission noted a tendency for projects to wither away for lack of commitment, care and attention, possibly as a result of the premature switching of staff to other duties. This issue relates both to project follow-up and quality control of publications. In most cases, problems which can do considerable harm to ESMAP's reputation could probably be put right by relatively very small additional effort and resources.

Some project reports, for example, have never been finished, leaving partial records of work carried out and vague recommendations for further action. The completion of some reports has been long delayed (in one case by at least three years). As a result, dissemination is less effective than it should be and product quality suffers as data and ideas get out of date. In other cases, reports show serious signs of careless editing and proof reading which do nothing to enhance ESMAP's reputation for producing generally high quality publications.
In this context, the mission feels that more could also be done to round off and follow-up on projects by distributing ESMAP (and other World Bank publications) to its clients: for example, Technical Reports to do with energy as well as additional copies of project publications. Additional costs to projects would be tiny for a sizeable increase in client goodwill. Several agencies visited by the mission expressed strong opinions on this specific issue, pointing out that they lacked funds to buy foreign publications.

More cautious self-confidence
ESMAP projects and publications have considerable influence and authority in client countries and, through wider dissemination of Bank publications, the world. It is of the utmost importance, therefore, that care is taken not to abuse this authority and respect by over-hasty analysis and presentation of ideas which stand a good chance of becoming global received wisdom.

In the mission's view, this problem arises rather too frequently for comfort in the project publications it has reviewed. The most serious instance, hinted at above, concerns the use of poor data on biomass stocks and yields to identify fuelwood supply "deficits", typically as the prelude to recommendations for large-scale forestry projects designed to reduce or close them. In the vast majority of cases, a more honest and useful approach is to admit that data are too weak to identify whether such deficits (or surpluses) exist; in short, to admit "we don't know". Recommendations can then be made to conduct appropriate surveys to rectify this failing or, better still, to pursue some of the many beneficial programmes and actions which can enhance energy supplies and do not need to be justified by the supposed existence of fuelwood deficits.

Similarly, data estimates sometimes first appear in ESMAP reports suitably labelled as extremely uncertain and requiring confirmation, but are found elsewhere as firm and confident assertions of fact. A prime example is provided below in Section 2. Or again, one finds confident assertions that this or that course of action should be adopted with little analysis or argument to back them.

In the mission's view, these comments raise some quite deep issues concerning the appropriate "style" of ESMAP operations, its approaches to the energy issues and problems it tackles, and the tone of project publications.
2. VIETNAM

Background

World Bank involvement in the energy sector in Vietnam is relatively recent. The first major initiative was the *Energy Sector Investment and Policy Review* carried out in collaboration with UNDTCD in 1991-92 with funding from UNDP. The resulting two-volume report, authored by A. Malhotra, was published by the World Bank in June 1993.

During this review it became evident that there was a lack of basic data on household and rural energy use which prevented any serious analysis of potential problems or meaningful policy making. The government of Vietnam expressed an interest in obtaining assistance to pursue the rural and household energy issue further and asked that such assistance should include a substantial training component in energy planning and integrated rural energy planning in particular. ESMAP accordingly began work in 1992 on a study of rural and household energy. This was carried out in collaboration with the Institute of Energy, in Hanoi, and was funded by $370,000 from Sweden's contribution to ESMAP's core funds.

Surveys of household energy consumption in parts of the Red River delta and of fuel prices in Hanoi, Da Nang and Ho Chi Min City were designed and carried out in mid-1992 by the Institute of Energy with support from an ESMAP consultant. The results were analysed in Hanoi using the SPSS statistics software package which was new to the Institute. ESMAP also supported the travel to Washington of three senior Vietnamese government staff to participate in the review of the draft report. The final report, *Vietnam: Rural and Household Energy Issues and Options*, was published in January 1994.

The report showed that rural households relied on "low grade" fuels - leaves, stalks and crop residues - as their main source of energy, except in the Mekong delta and the mountain regions. In urban areas, while fuelwood was the main cooking fuel, coal briquettes and electricity were being used to an increasing extent, especially in Hanoi and the Red River delta. The study found that because of these trends domestic cooking had become a major element in the peak load on the electricity supply system, an issue of considerable importance to policy-makers in the power sector because of the low prices being charged to domestic consumers. Other findings were that the energy efficiency of the typical fuelwood and coal stoves used in Vietnamese households was low and that coal briquettes were manufactured by inefficient and environmentally damaging methods.

A programme to promote improved stoves was already under way at the Institute of Energy but was small, under-funded and ineffective. ESMAP therefore proposed a programme of technical assistance to the Institute to support the preparation of a phased and costed plan of action for designing and disseminating commercially viable stoves.

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1 Technical assistance was also provided by ESMAP for a Power Sector Reform and Restructuring project but this was not within the terms of reference of the TAG mission.
improved fuelwood stoves and a similar plan of action for improving the efficiency of coal briquette production. The project was funded by a grant of $199,000 from Sweden.

The project completion report for these activities, *Improved Coal Briquetting and Commercialized Dissemination of Higher Efficiency Biomass and Coal Stoves*, was published in October 1995. This is, in effect, a project proposal for follow-up activities. It sets out a programme of research and demonstration of improved briquette manufacturing techniques and another programme for the production and dissemination of improved coal briquette and fuelwood stoves.

The project has been very favourably received by UNDP and is presently being discussed as a possible candidate for GEF funding. If it passes this initial scrutiny, it will be drawn up in the appropriate format and submitted to GEF.

**Mission findings**

For convenience of reporting, the mission findings are structured in accordance with the items on which specific comments were sought in the ToR. The two projects reviewed are dealt with separately. The references are based on the numbering in the ToR.

**Project 1: Rural and Household Energy Issues and Options**

6 (a) *Delivering timely advice*

The ESMAP assistance has been timely and relevant. Although household and rural energy consumption accounts for about two-thirds of total energy consumption in Vietnam, there was little reliable or consistent information available prior to the ESMAP work. Previous technical assistance in the area of household and small scale energy sources by other external agencies was fragmented and inconsistent in methodology. The ESMAP report provides a readily accessible summary of the available information. Although this is now rather dated, it is nevertheless a useful starting point for further survey work, analysis and project identification by organisations within Vietnam or by external donor agencies.

6 (b) *Degree to which the assistance program has been client-driven to fulfil their high priority needs*

Development of the power sector has the highest priority in the eyes of the Vietnamese authorities. Rural and household energy has not been a major concern of policy-makers. Arguably, the sector should be a matter of greater concern since the majority of the population, and especially women and lower income families, are affected by problems which arise in the supply and use of rural and household energy. ESMAP's activities have raised the profile of household and rural energy issues, as well as local capacities to deal with them and argue for their importance. They have therefore done much to
ensure that these issues will be given a higher priority in future national discussions on energy.

6 (c) Extent to which assistance furthered the building of institutional capacities

The energy surveys and their analysis involved a considerable amount of institutional building and skills transfer as neither the survey methodology nor the use of SPSS software were previously known in Vietnam. The Institute of Energy regard this transfer of skills as "most valuable" and now bases its surveys and analyses in this sector on ESMAP methodologies. However, Institute staff told the mission that training in the use of SPSS had proved to be inadequate and that further training is required (and cannot be obtained within Vietnam) if people are to operate the software with confidence and independently.

6 (d) Extent to which the assistance facilitated the process of sustainable policy reform in the energy sector...In particular, to what extent did the ESMAP assistance contribute to finding "solutions" and implementing them?

ESMAP activities have revealed to energy policy-makers that the rural and household energy sector is important. There is now an acceptance that issues arising in this area can be addressed in a variety of ways such as, for example, the improved coal briquetting and improved stove project.

7 (a) Extent to which the operating region viewed the ESMAP assistance as a key element to better target its technical assistance and lending strategies in the energy sector...

It was not apparent to the mission that ESMAP activities in the rural and household energy sector had any major impact on the Bank's other activities in the energy sector. This is because the rural and household sector is almost entirely uncoupled from the remainder of the energy sector.

Two exceptions which were highlighted in the Issues and Options report are the domestic use of electricity for cooking - which is a major contributor to the daily peak load - and the need to develop a coherent approach to rural electrification. These issues have fed into the discussions on the power sector between the World Bank and Vietnamese authorities. In its negotiations with the Vietnamese government on the Power Development Project², the Bank recommended that the tariff charged to domestic consumers, for consumption over the minimum block, should be increased at least to the levels charged to commercial consumers as a means of ensuring that domestic consumers receive the right price signals. The Power Development Project also includes a component for drawing up a rural electrification Master Plan which is presently being discussed with a number of donors.

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7 (b) The additional resources that ESMAP assistance represented relative to the Region's sector work and technical assistance resources available for the energy sector

Compared with the $180 million for the Power Development Project, the ESMAP resources are negligible.

8 (i) How donor funding for the activity has contributed to the donor agency's technical assistance and lending strategy

SIDA (Sweden), which provided the funding for both projects reviewed, does not have any other activities in the rural and household energy area in Vietnam at present. The funding was provided to activities which fall within general SIDA interest and meet its funding criteria but are not being implemented directly by SIDA in Vietnam at the moment. The ESMAP activities are thus complementary to SIDA's. Should SIDA decide to widen its present scope of activity into the rural and household energy area, however, the ESMAP work would provide a basis for selecting specific areas of interest.

8 (ii) The effect of the timeliness of resources made available to the ESMAP activity on the overall effectiveness of the assistance given limited "windows of opportunity" that often exist, especially in policy oriented assistance.

The resources were made available to ESMAP at a time when Vietnam was opening up to the external world and, in particular, to the Bank. This enabled ESMAP to grasp a unique window of opportunity. Because of the timeliness of the assistance, ESMAP was able to introduce a coherent and disciplined approach to rural and household energy analysis which did not exist previously. This will undoubtedly be a significant benefit to future initiatives, whether by other donors or Vietnamese organisations, in this area.

9 (a) Product quality

The "Rural and Household Energy Issues and Options" report is a summary of the available information on rural and household energy in Vietnam. Some of the information it contains had previously existed only in a scattered and inaccessible form. The report also contains a substantial amount of new information from the surveys carried out in collaboration with the Institute of Energy. In addition, it highlights areas of concern for Vietnamese policy-makers of which they were not previously aware.

In general, the product quality is high in terms of the information, analysis and presentation. As a result of ESMAP's efforts, it is possible to comprehend what is happening in the rural and household energy sector and identify problems and potential solutions which otherwise would not be apparent to policy-makers.

However, there is one important exception to this broadly favourable judgement. The mission believes that the woodfuel analysis in the report is weak and potentially very misleading as a basis for project and policy development.
To a large extent, the woodfuel analysis relies on the identification of "deficits" or "gaps" between woodfuel consumption and sustainable supply. The validity of this technique obviously depends upon having reasonably accurate estimates of both quantities. Whereas fairly reliable consumption estimates can be derived from well-conducted household energy surveys, reliable supply estimates demand extensive and costly field surveys of all forms of biomass which might be used by local people (natural forests and woodlands, plantations, farm and other scattered trees, shrubs, etc.). Furthermore, this technique has little theoretical or practical justification - not least as a means of projecting woodfuel demand, supply and "deficits", one of its principal uses as a tool for policy analysis - and is now widely discredited.

Similarly, the concept of "mining" forest resources, which is presumed in the report to take place when a woodfuel "deficit" occurs, may not be a useful guide to energy or forestry policy-making. "Mining" of forests, in the sense of depleting them faster than they are regenerating, is most commonly associated with agricultural expansion rather than fuelwood harvesting. The precise causes of biomass resource "mining", the degree to which the effects are, on balance, socially or environmentally undesirable, and appropriate project or policy remedies, can be established only by much more detailed and broadly-based investigations in the areas concerned than were conducted in this project.

The mission is also concerned at the way that in this project (as in other ESMAP activities) key data are transformed from highly uncertain first-cut estimates (guesses) into authoritative statements of fact. Not only does weak data thereby acquire a spurious certainty. Because they are in a World Bank report they tend also to acquire considerable national and global authority as they are repeated in other documents.

A good example is found in Annex VII of the "Rural and Household Energy Issues and Options" report. This contains detailed estimates of the growing stocks and yields of various tree formations, with little if any reference to the data sources or their quality. These estimates are, however, presented as preliminary, together with remarks about the "urgent need" to improve on them by conducting biomass inventories. In the main report aggregate biomass data derived from Annex VII are presented in Table 3 as "mission estimates" with no further comment on their provenance or reliability. This table is accompanied by remarks that there "may be" woodfuel deficits in some regions of the country. However, elsewhere in this report, and in other World Bank reports (e.g. "Viet Nam: Environmental Program and Policy Priorities for a Socialist Economy in Transition", AEOD/Country Department 1, 27 February 1995) the sizes of woodfuel deficits in Vietnam are presented as precise and authoritative numbers without any qualifications.

These remarks are not intended to deny that loss of forest land, cutting trees for fuelwood or the use of agricultural residues for fuel, may have negative social and environmental effects. But these effects, if they exist in particular areas, are not adequately measured by calculating fuelwood "deficits". Similarly, the existence of fuelwood "deficits" provides no guidance on whether fuelwood, or even multipurpose species plantations, are likely to be financially or economically viable, or socially acceptable. A recommendation such as the one in this report that there should be a
575,000 hectare, $30 million, tree planting programme with the objectives of watershed protection and expansion of fuelwood supplies (page 47) needs a far more penetrating analysis at all levels than it has apparently been given.

9 (i) Degree of reliance on consultants, ESMAP and Bank staff for the design, resources mobilization, and implementation of the activity

(ii) Extent of balance in the use of ESMAP/Bank Staff as major interlocutors especially during implementation, versus being largely supervisors of consultants delivering a "turnkey product."

The overall shape and direction of the project has clearly been determined by ESMAP. The ESMAP task manager was a major, and well-regarded, interlocutor during the implementation of the project. There is no indication that the project is a turnkey product determined by consultants. With its generally high level of competence and presentation, and certain weaknesses, it is clearly an ESMAP product.

Project 2: Improved Coal Briquetting and Commercialized Dissemination of Higher Efficiency Biomass and Coal Stoves

6 (a) Delivering timely advice

The advice provided is timely and relevant. The study has identified a "solvable problem" which, if it is addressed, could bring significant social and environmental gains. Without the ESMAP initiative, it is unlikely that the possibilities for beneficial action would have been so quickly identified as candidates for funding by GEF or other external sources.

6 (b) Degree to which the assistance program has been client-driven to fulfil their high priority needs

As mentioned earlier, the main concerns of the Vietnamese authorities are focused on the power sector with its need for extremely large investments. This project does not therefore respond to a high-priority need expressed by the Vietnamese authorities. ESMAP, however, has not imposed a project but has identified a potential energy area in which environmentally and socially beneficial actions might be carried out with the assistance of external funding. The project could therefore be said to widen the range of policy concerns and the menu of possible actions for Vietnamese policy makers beyond that previously existing.

6 (c) Extent to which assistance furthered the building of institutional capacities

This is a relatively low key exercise in project identification carried out in collaboration with the Institute of Energy. A certain amount of institutional capacity building occurred as a result of this collaboration. The project which has been proposed, however, if it is successfully implemented, should have significant positive impacts in
terms of improved skills and products in the coal-briquetting and stove-manufacturing industries.

6 (d) Extent to which the assistance facilitated the process of sustainable policy reform in the energy sector... In particular, to what extent did the ESMAP assistance contribute to finding "solutions" and implementing them?

The ESMAP activity has clearly identified a set of significant problems and suggested an approach to solving them. If the proposed pilot project is implemented successfully, it should provide a basis for the setting of new manufacturing standards for coal briquettes and fuelwood and coal briquette stoves.

7 (a) Extent to which the operating region viewed the ESMAP as a key element to better target its technical assistance and lending strategies in the energy sector...

The proposed project is not central to the thinking of the operating region of the Bank in targeting its technical assistance and lending strategies in the energy sector, which are focused mainly on large power development programmes. However, it was suggested to the mission that the Bank might have taken more interest in the project if more had been done to "sell" it to Bank staff in Hanoi and Washington DC; for example, with a view to its inclusion as a poverty-alleviating component in the forthcoming Country Economic Memorandum.

7 (b) The additional resources that ESMAP assistance represented relative to the Region's sector work and technical assistance resources available for the energy sector

In comparison with the sums involved elsewhere, notably in the power sector, the resources involved are insignificant.

8 (i) How donor funding for the activity has contributed to the donor agency's technical assistance and lending strategy

The proposed project is not attractive to SIDA in its present form because of what SIDA feels is its focus on technical issues, its top down nature, its lack of consideration of gender issues, and its failure to build up local coalitions of potential actors. SIDA would, however, be prepared to re-examine the project if it were to be revised to incorporate a gender dimension and, especially, if it were to be given a high priority by the Vietnamese government during the annual discussion of the SIDA assistance programme.

8 (ii) The effect of the timeliness of resources made available to the ESMAP activity on the overall effectiveness of the assistance given limited "windows of opportunity" that often exist, especially in policy oriented assistance.

The issue addressed is not time-critical. There are significant and avoidable energy, economic and environmental costs being incurred at present as a result of inefficient manufacture of coal briquettes and the generally inefficient use of domestic cooking
fuels. If the proposed project is successfully implemented, permanent improvements in these areas can be expected.

9 (i) Product quality

The report deals with two separate themes: potential improvements in the manufacture of coal briquettes and potential improvements in the efficiency of domestic stoves. In both cases, the mission is impressed with the analysis and recommendations.

In the case of the improved coal briquettes, the project has identified the major manufacturers, examined the existing techniques they use and proposed a set of potential improvements which might be made. These improvements would reduce waste, increase output and provide a better briquette for the consumer. The measures appear to be practical, the choice of major manufacturers provides a plausible entry point, and any favourable results should be disseminated quickly though the industry.

In the case of improved cooking stoves, Vietnam differs from many other developing countries in having a substantial formal industry for manufacturing and marketing stoves. Again, the project shows clearly how this provides focal points for technical improvements, consumer testing, and the incorporation of improvements into the mainstream of stove manufacturing.

The mission concludes that this is a high quality product. It fully achieves its objective of providing a firm basis for a pilot project to confirm its findings and take forward its recommendations.

9 (ii) Extent of balance in the use of ESMAP/Bank Staff as major interlocutors especially during implementation, versus being largely supervisors of consultants delivering a "turnkey product."

As in the case of the Issues and Options paper, this project bears the stamp of ESMAP and shows no sign of being a turnkey product delivered by consultants. The ESMAP task manager was a major interlocutor during the implementation of the project. His influence was decisive in having it taken up by UNDP for possible funding under GEF.

Mission interviews

During its stay in Hanoi, the mission interviewed the following people:

World Bank
- Paul Stott Senior Operations Officer
**Written material consulted**


"Power Sector Reform and Restructuring in Viet Nam: Final Report to the Steering Committee." Blue Cover. ESMAP (September 1995).


3. CHINA

Background

Involvement by ESMAP in the People's Republic of China dates from 1987 when a request for assistance to support government efforts to promote rural energy planning was made to it by the Ministries of Agriculture and Forestry and approved by the State Planning Commission. A further request for ESMAP assistance in improving the technical, institutional and financial performance of decentralised power companies was made by the State Planning Commission in 1988. A number of strands of ESMAP activity were followed in the subsequent years. Although these are to a greater or less extent interlinked, they are described below under four separate headings.

1. Rural and household energy

Work on the initial response to the request for assistance on rural energy planning was carried out by a joint ESMAP-Chinese team between September 1987 and February 1989. The work began with a household energy survey carried out by an ESMAP-Chinese team in the counties of Hengnan in Hunan Province, Xiushui in Jiangxi Province and Kezuo in Liaoning Province in early 1988. This was followed by a rural energy assessment of the same three counties in May-June 1988. A report entitled County-level Rural Energy Assessments: a joint study of ESMAP and Chinese experts was published by ESMAP in May 1989.

This project identified a total of nine possible follow-up activities. These included three projects which were subsequently implemented, the first of them rapidly, with completion before the end of 1989:

- Fuelwood Development and Conservation Project: Hunan Province;
- Planning and Management of Decentralized Power Companies; and

Other proposals which have not been taken further include research into space heating in Northern China, the establishment of provincial stove centres, forestry research and training projects and biomass resource assessments.

The activity carried out under the title "Fuelwood Development and Conservation Project: Hunan Province" covered the preliminary research and analysis required to develop the project proposal of this name. The proposal was produced in December 1989. It was for a $7.7 million multi-component project in Hengnan County which included 20,000 hectares of fuelwood and timber plantations, distribution of 2 million seedlings to households, assistance to improve the forestry extension system, an improved fuelwood stove programme and a number of institutional-strengthening elements. This project has not been funded.
During the project various training programmes were carried out. Four technicians attended World Bank training courses on the SPSS (statistics) software. A number of Chinese personnel spent the summer of 1989 at Pennsylvania University taking a course in statistical analysis. A 400-page book on "Rural Energy Development in China" and another 400-page book entitled "County Level Integrated Rural Energy Planning and Implementation" were produced in Chinese with assistance from World Bank staff.

Some documents were also produced by the project, but in a somewhat desultory manner. The initial vigorous activity and later loss of momentum and failure to secure follow-up funding prompted the wry comment by a senior Chinese official that the project "began as a tiger but ended like a snake".

Interim findings of the household energy survey were published in January 1991. A draft paper comparing tree-farming in the first three surveyed counties with international experience was produced in 1990 but never published. The assessment approach developed in the three counties was subsequently used in a further three counties and gave rise to some working papers. These were on "Integrated Hillside Biomass Development", "Stoves in Three Counties of China", and "A Comparative Analysis of Rural Household Fuel Development Options in Three Chinese Counties" and provided the basis for the proposed fuelwood project in Hunan Province referred to above.

A report summarising briefly the various activities and findings of the programme was prepared by ESMAP for a Symposium on Rural Energy in China, held in Beijing in November 1992. It took three years, until December 1995, to prepare the final draft (green cover) version of the report, under the title Energy for Rural Development in China: an assessment based on a joint Chinese/ESMAP study in six counties. At the time of writing the draft is being prepared for final publication.

2. Planning and Management of Decentralized Power Companies

About 800 of the 2,200 counties in China rely on decentralised power companies for their electricity supplies. In June 1989 a joint team from the Ministry of Water Resources (MWR) and ESMAP was formed to carry out a broad review of the problems being encountered in the power companies and prepare a Plan of Action. It was agreed that the implementation of the Plan of Action would form Phase II of the technical assistance. The political events of 1989 interrupted the programme but an ESMAP team visited the country in December 1990 and carried out field work. A workshop was held in China in December 1990 to discuss the findings and recommendations. A study tour of Bangladesh and the Tennessee Valley Authority in the United States arranged for the Chinese counterparts took place in September 1991.

An interim report Planning and Management of Decentralized Power Companies was produced in April 1992. This summarised the results of Phase I and presented a series of proposed actions for Phase II. The main identified areas of concern included:

- Technical problems in the design of small hydro plants;
- Problems in the efficiency of distribution systems and system losses;
• Power planning problems in connection with load forecasting and system planning;
• Institutional problems in connection the definition of the roles of government in relation to the autonomy of power companies;
• Financial reporting and control problems in the running of the power companies.

A programme of technical assistance to address these concerns was proposed at a total cost of $3 million of which $1.777 would be in the form of foreign technical assistance. This programme was not funded.

A much more limited programme was then carried out, with a budget of $143,000 from ESMAP's unrestricted core funds. The emphasis was shifted to the institutional issues involved in "corporatization" of the power companies; that is, their transformation into limited liability companies. Two power companies were selected, one each in the prefectures of Ya'an in Sichuan Province and Huai Hua in Hunan Province, which it had been decided by the authorities should be changed to limited liability shareholding companies.

A first ESMAP-MWR mission visited the power companies in February 1994. The available data were collected but it was clear that considerably more would be needed. The MWR then collected the required data and a second ESMAP/MWR mission visited the power companies. A report entitled *China: Commercialization of Decentralized Power Companies* was produced by ESMAP in May 1995.

This report records the observations, conclusions and recommendations resulting from both missions. It provides a considerable amount of historical data on the two decentralized power companies. Otherwise it is generalised and educational rather than specifically prescriptive. Thus, it discusses the notion of "corporatization" and how to achieve it, basically by describing the functioning of a joint stock company and how it might be established within the Chinese legal framework. It similarly discusses "commercialization" and what it would involve for the power companies. It analyses the legal and regulatory framework required for the effective operation of a commercialised power company and makes a number of suggestions on how this might be achieved in China. It also discusses the requirements of effective financial management.

3. Energy Conservation and Pollution Control in TVE Industry

Township and village enterprises (TVE) which operate outside the framework of state ownership have been the most dynamic element in the Chinese economy in recent years. They are major users of coal, accounting for about a quarter of total industrial consumption. There is, however, much scope for improved energy efficiency and pollution control in these enterprises. Following an ESMAP reconnaissance mission in 1991, a request for assistance in carrying out such a study was made by the Chinese authorities to ESMAP. A project proposal was drawn up by ESMAP. Total funding of $217,000 was obtained, of which $127,000 came from Switzerland with the remainder from the Global Environment Facility.
Three industries were chosen for study: brick-making, coke-making, and metal casting. These are responsible for 40% of the coal consumption of TVEs and about half of their total carbon dioxide emissions. The project was conceived in the context of a number of other Bank projects, including a study of rural enterprises carried out in collaboration with the Chinese Academy of Social Sciences, a study of the environmental impact of coal use by the Bank's China and Mongolia Department, the "Spark" project under which a $64 million credit package was made available for upgrading TVEs in 1991, and a $2 million GEF project on greenhouse gas emissions.

The work was carried out by a Chinese team drawn from the Ministry of Agriculture's Department of Environment Protection and Energy and Department of Township and Village Enterprises, the State Planning Commission's Energy Research Institute, and several local experts. This team was assisted by ESMAP staff and international consultants with inputs from the Energy Technology Support Unit and the Coal Research Establishment, both in the UK.

The results of the study were published by ESMAP in December 1994 under the title *Energy Efficiency and Pollution Control in Township and Village Enterprises (TVE) Industry*. This report analyses the performance of a sample of enterprises in each of the three chosen industries. A series of economically-viable technical improvements in the brick and metal casting industries were identified. The report recommends a three-phase upgrading programme for these industries with a three year pilot phase starting in 1994 followed by a five-year expansion phase and a full implementation phase thereafter. In the case of coke-making, the study concluded that small scale manufacture had little future and should be phased out in favour of larger ovens which are more economic and environmentally cleaner.

A follow-up pilot project along the lines suggested has been approved for GEF funding of $1 million by UNDP. The aim is to raise the energy efficiency and reduce the carbon dioxide emissions of TVEs in the brick, coking, metal casting and cement industries.

It is expected that a further follow-up project will obtain an additional $7 million funding on completion of the pilot phase. The executing agency will be UNIDO, working in collaboration with the Ministry of Agriculture and the Energy Research Institute of the State Planning Commission.

### 4. Power Efficiency Pilot Study

The Power Efficiency Pilot project was carried out in collaboration with the Ministry of Water (MWR). It began in 1989 when an ESMAP mission visited three decentralised power companies. The project was agreed after a workshop in December 1990 but was delayed for a year by political events in China. It was resumed in 1991 with an ESMAP mission and a field study of three power companies. Total project financing is just short of $670,000, from ESMAP's core funds.

The project focused on rural power distribution analysis and the design of a programme of immediate steps for power loss reduction and longer term improvements to enhance
the efficiency of the decentralised power companies in two pilot counties. It was
implemented in three phases:

- a pilot study by an ESMAP/MWR team in Xin Chang province with special
  emphasis on training of Chinese counterparts. This was completed in late 1991;
- a second pilot study carried out by an MWR team in Dong An province under
  ESMAP supervision;
- the preparation of a plan of system efficiency improvement methodologies and
  techniques for wider dissemination among the country's decentralised power
  companies.

The project developed daily demand profiles for the systems studied and estimated
technical losses in transformers and feeders. Because of the absence of reliable data,
this was a relatively complex and time-consuming activity. The project then carried out
an economic evaluation of options to reduce losses. It also reviewed procedures for
customer management, from metering through to bill collection. A draft report entitled
*China: Power Efficiency Pilot Study* was produced by ESMAP in April 1993.
Although this contains much useful information, the annex on Major Findings and
Recommendations of the First Phase is blank. A final draft report (green cover) is
planned for the end of March 1996, to be followed by the final (blue cover) report at the
end of May 1996.

There were also various training activities within this project. A large training manual
(200 pages plus) on electrical distribution network planning, based primarily on
Electricité de France practices, was translated into Chinese. Software and training in
management information systems were provided by ESMAP. Although the MWR staff
interviewed were happy with what had been achieved, the project appears to have
 petered out through lack of funding.

This project was not included for formal review in the ToR of the mission and is not
therefore discussed further in the following sections.

**Mission findings**

As for Viet Nam, the mission findings are structured in accordance with the items on
which specific comments were sought in the ToR. The three groups of projects are dealt
with separately in the following comments. The reference numbers refer to the
numbered paragraphs in the ToR (see Annex A).

**Project 1: Rural and household energy**

6 (a) *Delivering timely advice*

At the time the initial study was carried out, there was little awareness in China of ways
to approach rural energy issues and the data on rural energy consumption were
fragmentary and inconsistent. A variety of statistical methods for analysing survey data, as well as economic appraisal techniques such as least-cost and benefit-cost analysis, were introduced to the Chinese counterparts during this activity. The project was timely in its introduction of a range of new and useful concepts at a time when there was a need and willingness amongst ESMAP's Chinese partners to accept them.

6 (b) Degree to which the assistance program has been client-driven to fulfil their high priority needs

The requests for assistance came from the Chinese authorities. During the 1980s, the Chinese government had been paying increasing attention to energy planning in the rural areas and gave this topic a relatively high priority. The considerable support given by ESMAP to these efforts, especially in the earlier phases, seems to be much appreciated by all the officials who were interviewed during the mission.

6 (c) Extent to which assistance furthered the building of institutional capacities

The transfer of expertise appears to have been highly effective. Following the initial work in three counties, later extended to six counties, the Chinese government set up its own Integrated Rural Energy Development Program in 1991 incorporating the lessons learned from the work with ESMAP. This was later extended to 109 counties in what has become known as the Hundred Counties Program. A further 32 counties have subsequently joined the program and it is anticipated that this number will continue to rise.

6 (d) Extent to which the assistance facilitated the process of sustainable policy reform in the energy sector...In particular, to what extent did the ESMAP assistance contribute to finding "solutions" and implementing them?

The ESMAP assistance has introduced substantial changes into rural energy policymaking as noted above.

7 (a) Extent to which the operating region viewed the ESMAP assistance as a key element to better target its technical assistance and lending strategies in the energy sector...

The Bank's office in Beijing impressed the mission by its lack of awareness and interest in these ESMAP activities. This is perhaps not surprising in view of the enormous commitments by the Bank in other sectors in China: some $3,000 million in total, including $800 million for the power sector.

7 (b) The additional resources that ESMAP assistance represented relative to the Region's sector work and technical assistance resources available for the energy sector

These are negligible: see 7 (a) above.
8 (i) *How donor funding for the activity has contributed to the donor agency's technical assistance and lending strategy*

Not applicable, as the work has been financed by ESMAP core funds. See also points 7(a) and 7 (b) above.

8 (ii) *The effect of the timeliness of resources made available to the ESMAP activity on the overall effectiveness of the assistance given limited "windows of opportunity" that often exist, especially in policy oriented assistance.*

The initial ESMAP inputs came at a time when they could have a major impact on Chinese thinking about rural energy and were therefore extremely timely.

9 (a) *Product quality*

The methodologies used in the ESMAP activities have led to an increased awareness of rural energy issues. They have introduced a series of extremely useful planning concepts such as least-cost analysis and benefit-cost analysis. The joint work between ESMAP and Chinese personnel has also led to major improvements in the design, implementation and analysis of rural energy surveys. In all these aspects, as well as the general transfer of methods and attitudes, the ESMAP inputs are of high quality and undoubted value.

The mission's concerns with the fuelwood analysis are, however, the same as those expressed earlier in the Vietnam context. It would be possible to ignore these concerns on the basis that everything happened six or seven years ago and is now forgotten were it not for the belated publication of the "Energy for Rural Development in China" report (December 1995 in green cover, now undergoing editing for final publication) and the apparent continued interest of the Chinese government in addressing fuelwood shortages through the promotion of fuelwood plantations.

One of the mission's related concerns, also mentioned in the Vietnam review, is the elevation of highly dubious data into received wisdom. An example is Table 1.5 (page 7) in the "Fuelwood Development and Conservation Project in Hunan Province" report. Despite the obviously poor quality of the data, which is referred to in the text, a sustainable yield figure of 76,850 tonnes per year is quoted for the county and used to calculate a "current deficit of 210,000 tonnes of fuelwood."

The proposals for fuelwood planting flow from this calculation. The project's own analysis (page 23) shows that planting trees for timber has a much superior economic return than planting for fuelwood. This strong contra-indication about the social and economic viability of fuelwood plantations is, however, disregarded because "past experience in the county has already shown how fuel deficits result in the abuse of timber plantations by fuel collectors". The project concludes lamely that "at least some additional fuelwood resources" need to be developed.
Interestingly, this deficit methodology and associated recommendations for fuelwood plantations have almost disappeared from the December 1995 green cover draft of the "Energy for Rural Development in China" report. However, visible and possibly influential traces remain, such as the remark that in China a "considerable shortfall between [woodfuel] demand and annual [biomass] yield is still growing". The fact that senior Ministry of Agriculture officials told the mission that these omissions from the draft report were a "pity" suggests that these ideas, now apparently abandoned by ESMAP, have taken firm root in Chinese thinking.

A final point on product quality is that in this report, as in some others reviewed here, there are signs of sloppy editing or hurried proof-reading which detract from ESMAP's reputation for high quality work. To give just two examples from the December 1995 draft of "Energy for Rural Development in China", in paragraph 5.23 the energy used for boiling pig food is given as 1/4 to 1/2 percent instead of 1/4 to 1/2 (i.e. 25% to 50%) and in paragraph 5.24 the third sentence lacks a final word or words.

9 (i) Degree of reliance on consultants, ESMAP and Bank staff for the design, resources mobilization, and implementation of the activity
(ii) Extent of balance in the use of ESMAP/Bank Staff as major interlocutors especially during implementation, versus being largely supervisors of consultants delivering a "turnkey product."

The prime movers in all these activities were ESMAP staff. They were clearly the major interlocutors and there is no indication that the activities were delivered as turnkey products.

**Project 2: Planning and Management of Decentralized Power Companies**

6 (a) Delivering timely advice

Improving the energy efficiency of the decentralised power companies is an important task in China, where rapidly increasing electricity consumption is making major demands on the capital investment resources. The privatisation, or corporatization, of these power companies is also an issue of considerable concern. Interventions in these areas are therefore most timely.

6 (b) Degree to which the assistance program has been client-driven to fulfil their high priority needs

The programme was undertaken at the request of the MWR. The actual course of the activity, in which the recommended follow-up programme was not funded, was not particularly client-driven.

6 (c) Extent to which assistance furthered the building of institutional capacities
The first part of the study produced a series of recommendations for a follow-up project which was not funded. The build-up of institutional capacities was therefore limited to the expertise transferred during the joint analysis of the chosen two power companies during the subsequent workshop and study tour.

The second part of the activity appears to have helped build awareness of some of the issues involved in corporatization but at a rather academic level.

6 (d) *Extent to which the assistance facilitated the process of sustainable policy reform in the energy sector...* In particular, to what extent did the ESMAP assistance contribute to finding "solutions" and implementing them?

The activities have probably had some impact on policy in the sector but it is likely to have been relatively limited. This is because of the lack of follow-up to the initial activities and the generally education-oriented rather than action-oriented output of the second phase.

7 (a) *Extent to which the operating region viewed the ESMAP assistance as a key element to better target its technical assistance and lending strategies in the energy sector...*

As noted above, the Bank's regional office appears to take little notice of ESMAP activities. Its main concerns lie elsewhere in several very large lending programmes.

7 (b) *The additional resources that ESMAP assistance represented relative to the Region's sector work and technical assistance resources available for the energy sector*

These are negligible: see 7 (a) above.

8 (i) *How donor funding for the activity has contributed to the donor agency's technical assistance and lending strategy*

Not applicable, as the work has been financed by ESMAP core funds.

8 (ii) *The effect of the timeliness of resources made available to the ESMAP activity on the overall effectiveness of the assistance given limited "windows of opportunity" that often exist, especially in policy oriented assistance.*

The lack of resources for a follow-up to the first phase has meant that the effectiveness of the activity has been low. According to the Ministry of Water Resources, frequent changes of consultants employed by ESMAP added to project delays. The window of opportunity for an input in this area, however, remains open. The second phase, which deals mainly with relatively general issues, is not particularly time-critical.

9 (a) *Product quality*
The first part of the activity appears to have been effective in identifying technical and institutional weaknesses in the power companies and proposing approaches for dealing with them.

The second part of the activity appears somewhat unfocussed. Much of the final report seems to be elementary textbook material. Although much of this information may not have been previously available in China, where normal power company practice was to work to rigid and old-fashioned "rule books", arguably this is not a particularly cost-effective method of delivering it to its recipients.

It should also be noted that the report is quite opaquely written: 400-word paragraphs pose substantial problems even for those with English as a mother-tongue. The mission feels that it would have been more effective if a more explicit case-study approach had been adopted, for example through discussion and analysis of the practicalities and problems of corporatization which might be actually be experienced by the two power companies.

9 (i) **Degree of reliance on consultants, ESMAP and Bank staff for the design, resources mobilization, and implementation of the activity**

(ii) **Extent of balance in the use of ESMAP/Bank Staff as major interlocutors especially during implementation, versus being largely supervisors of consultants delivering a "turnkey product."**

The activities appear to have been largely determined by ESMAP and Bank staff rather than delivered as turnkey products.

**Project 3: Energy Conservation and Pollution Control in TVE Industry**

This activity was not included in the ToR for the TAG mission. Having read the relevant documents and discussed the project with officials in Beijing, however, the mission believes that a brief review might nevertheless be helpful to ESMAP and its donors.

6 (a) **Delivering timely advice**

The TVE sector is already large and is also the most dynamic sector of the Chinese economy. Identifying measures which can increase the energy efficiency and reduce the pollution of the sector, as this project does, is therefore most timely.

6 (b) **Degree to which the assistance program has been client-driven to fulfil their high priority needs**

The request for assistance came from the Chinese authorities and much of the work was carried out by Chinese staff. The implementation and follow-up of the project has been keenly supported on the Chinese side. The assistance has therefore been strongly client-driven.

6 (c) **Extent to which assistance furthered the building of institutional capacities**
The work carried out to date has been devoted primarily to identifying areas for effective intervention by means of a follow-up pilot programme. However, during this process a large number of Chinese engineers and other specialists have been exposed to and learned from international industrial "best practices". The resulting transfer of skills and capacity building has been substantial. More formal approaches to building institutional and technical capacity will be a matter for discussion when the results of the pilot programme begin to be available.

6 (d) Extent to which the assistance facilitated the process of sustainable policy reform in the energy sector... In particular, to what extent did the ESMAP assistance contribute to finding "solutions" and implementing them?

See comment in 6 (c) above.

7 (a) Extent to which the operating region viewed the ESMAP assistance as a key element to better target its technical assistance and lending strategies in the energy sector...

There has been little or no interest by the operating region: see comments under this heading above.

7 (b) The additional resources that ESMAP assistance represented relative to the Region's sector work and technical assistance resources available for the energy sector

These were negligible: again, see comments above.

8 (i) How donor funding for the activity has contributed to the donor agency's technical assistance and lending strategy

Not applicable, as the project was financed from ESMAP's core funds.

8 (ii) The effect of the timeliness of resources made available to the ESMAP activity on the overall effectiveness of the assistance given limited "windows of opportunity" that often exist, especially in policy oriented assistance.

The availability of resources was timely in the sense that it enabled the activity to take place at a time of rising concern over environmental issues in China as well as increasing interest in the TVE sector. The fact that significant additional funds are not available to continue and enlarge the programme - for example, in more counties, for more industries, and with more demonstration projects - is seen by Chinese officials as the only serious weakness of the project. But this failing is neither unusual in less developed countries nor specifically the fault of ESMAP.

9 (a) Product quality
The product quality is high. The report of the activity was published in its final form in December 1994. It is well presented and written. It also provides clear and precise recommendations on follow-up activities. Indeed, the high quality of the project as a whole and, in particular, its effectiveness in training a critical mass of Chinese experts, was singled out by UNDP as a major reason why GEF funding for a follow-up pilot project has been obtained.

It is also noteworthy that the study was planned within the context of a range of other relevant activities by the Bank and other agencies. It was made clear to the mission that funding of the follow-up project under the GEF has come about because this had been a target from the beginning and because of the effective lobbying carried out by the task manager.

9 (i) Degree of reliance on consultants, ESMAP and Bank staff for the design, resources mobilization, and implementation of the activity
   (ii) Extent of balance in the use of ESMAP/Bank Staff as major interlocutors especially during implementation, versus being largely supervisors of consultants delivering a "turnkey product."

Although considerable reliance was placed on consultants for some of the technical analyses, the project is clearly an ESMAP activity rather than a turnkey product. The task manager was a major and well regarded interlocutor during the project and in following it up.

**Mission interviews**

During its stay in Beijing, the mission visited the following institutions and people:

**World Bank**
- Dr. Zhao Jianping Operations Officer (Energy)

**UNDP**
- Ms. Susan McDade Assistant Resident Representative
- Wu Ruhu Senior Program Officer, Division of Environment & Energy

**Ministry of Agriculture**
- Wang Xiwu Director, Dept. Environment Protection & Energy
- Madam Deng Keyun (ex Vice Director, Dept. Environment Protection & Energy); now Director General, Rural Energy Committee, CERS; Vice Director, China Association of Rural Energy Industry
- Zhang Lujiang Division Chief, Dept. Township & Village Enterprises
- Yang Yue-Xian Director, Dept. Forest Resources Policy Administration
- Shangbin Gao Deputy Director, Science, Technology & International Cooperation Division, Dept. Environment Protection & Energy

Also at Ministry of Agriculture meetings
- Liu Hongpeng Deputy Chief, Renewable Energy Division, State Economic & Trade Commission
- Wang Gehua Director, Institute of Rural Energy & Environmental Protection, Chinese Academy of Agricultural Engineering Research & Planning

Ministry of Water Resources
- Zheng Xian Director General, Dept. Hydropower & Rural Electrification
- Han Dong Deputy Division Chief, Dept. Hydropower & Rural Electrification
- Luan Lan Project Officer, Dept. International Cooperation

Written material consulted

Rural and Household Energy

"County-level Rural Energy Assessments A joint study of ESMAP and Chinese Experts" (Summary chapter only). ESMAP (May 1989).


Commercialization of Decentralized Power Companies
"Project proposal for Technical Assistance for the Commercialisation of County-level Power Enterprises." ESMAP (undated).


**TVE Project**


"China: Energy Efficiency and Pollution Control in Township and Village (TVE) Industry".


**Miscellaneous**