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Norad

State-of-the-art study: The long-term effects of assistance to the power sector

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State-of-the-art study: The long-term effects of assistance to the power sector

Final Report

By

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LIST OF ACRONYMS

ADB = Asian Development Bank
ADTA = Advisory Technical Assistance
AEPC = Alternative Energy Promotion Centre, Nepal
AfDB = African Development Bank
BPC = Bhutan Power Corporation
CAS = Country Assistance Strategy
CGE = Computable General Equilibrium (analytic models)
CIF = Cost, Insurance, Freight
CMI = Christian Michelsen Institute, Bergen, Norway
DAC = Development Advisory Committee
DHS = Demographic and Health Survey
DKK = Danish Kroner
DNE = National Directorate of Energy, Mozambique
DoP = Department of Power, Bhutan
DWA = Department of Water Affairs, Namibia
EBRS = Energy Business Renewal Strategy
EDM = Electricidade de Mozambique
EIA = Environment Impact Assessment
ENPV = Economic Net Present Value
ERA = Energy Regulatory Authority
ESAP = Energy Sector Assistance Programme, Nepal
ESMAP = Energy Sector Management Assistance Programme (World Bank)
EV = Economic Value
EVAL = Norad's Evaluation Department
FDI = Foreign direct Investments
FFT = Fuel for Thought
GDP = Gross National Product
GEF = Global Environment Facility
GHG = Greenhouse Gases
GIEK = Garanti-Instituttet for Eksport Kreditter
GoU = Government of Uganda
ICA = Investment Climate Assessment
ICH = International Centre for Hydropower
ICOLD = International Commission on Large Dams
IDA = International Development Agency
IDB = Inter-american Development Bank
IDCOL = Bangaldesh Infrastructure Development Company
IEG = Independent Evaluation Group (in the World Bank Group)
IFC = International Finance Corporation
IFPRI = International Food Policy Research Institute
I/O = Input/Output
IPP = Independent Power Producer
IRA = Independent Regulatory Agency
IREF = Interim Rural energy Fund
kWh = Kilowatthour
LSMS = Living Standard Measurement Surveys
LPG = Liquified Petroleum Gas
MFA = Ministry of Foreign Affairs

MDG = Millennium Development Goal
MH = Micro Hydro
MIGA = Multilateral Investment Guarantee Agency
MME = Ministry of Mines and Energy, Namibia
MN = Mphanda Nkuwa
MOEST = Ministry of Environment Science and Technology
MOPE = Ministry of Population and Environment, Nepal
MRLGH = Ministry of Regional and Local Government and Housing
MWh = Megawatthours
NCG = Nordic Consulting Group AS
NDE = National Directorate of Energy
NFP = Norad Fellowship Programme
NGO = Non-Government Organization
NIMES = National Integrated Monitoring and Evaluation Strategy
NIVA = Norwegian Institute for Water Research
NNCOLD = The Norwegian National committee on Large Dams
NOK = Norwegian Kroner
NPD = Norwegian Petroleum Directorate
NPV = Net Present Value
NRS = Nepali Rupees
NTNU = Norges Teknisk-naturvitenskapelige Universitet
NVE = Norwegian Water Resources and Energy Directorate
OBA = Output Based Aid
OECD = Organization of Economic Cooperation and Development
OED = Operation Evaluation Department
PFRP = Pangani Falls Redevelopment Project
PIR = Poverty Impact Ratio
PO = Private Operator
PPA = Power Purchasing Agreement
PPAH = Pollution Prevention and Abatement Handbook (World Bank Group)
PPP = Private Power Providers
PPTA = Project Preparatory Technical Assistance
PRSP = Poverty Reduction Strategy Paper
PSDE = Private Sector Development in the Electric power sector
PSRPS = Power Sector Restructuring and Privatization Strategy
PULIS = Program for Upgrading Local Infrastructure Services
PV = Photovoltaic, and elsewhere “Present Value”
PWA = Palestinian Water Authority
REB = Rural Electrification Board, Uganda
RERED = Rural Electrification and Renewable Energy Development
REG = Regional Electricity Board (Uganda)
RFF = Resources for Future
RSA = Republic of South Africa
SADC = Southern African Development Community
SAM = Social Accounting Matrix
SAPP = Southern Africa Power Pool
SCADA = Supervision Control and Data Acquisition System
SEK = Swedish Kroner
SEMAN = Solar Electricity Manufacturers Association
SERF = Shadow Exchange Rate Factor

SFT	=	Statens Forurensingtilsyn
SHS	=	Solar Home Systems
SIDA	=	Swedish International Development Agency
SWR	=	Shadow Wage Rate
TA	=	Technical Assistance
TANESCO	=	Tanzania Electric Supply Company LTD
TI	=	Transparency International
TOR	=	Terms of Reference
UNDP	=	United Nations Development Programme
USAID	=	US Agency of International Development
USD	=	US Dollar
UTIP	=	Technical Unit for Implementation of Hydropower Projects, Mozambique
VAT	=	Value Added Tax
WBG	=	World Bank Group
WCD	=	World Commission on Dams
WHO	=	World Health Organization
WRI	=	World Resources Institute

PREAMBLE

This report is a "State of the art" study of the long term impacts of assistance to the power sector. The report has been prepared by Stein Hansen of Nordic Consulting Group AS (NCG Norway) under a framework contract between Norad and NCG Norway. Tore Laugerud and Jens Claussen (NCG Norway) have provided quality assurance of the manuscript. Jon Teigland and Øistein Gløммi, Norad, have provided valuable guidance and comments to the draft report. Work on the report commenced in December 2005.

The report is for the most part based on comprehensive desk work and analysis of data and reports collected from Norad archives with the help of Norad staff, from the key Norwegian consulting firms and institutions responsible for projects preparation and implementation as well as institutional advisory services contracts. In addition, many recent reports and data were collected during and after a visit to several institutions engaged in power sector analysis in Washington D.C. Based on these meetings and interviews, as well as contacts during the summer with evaluation experts and power sector experts at the Asian Development Bank, recent studies and analytic results have been received and downloaded for use in this report.

The report would not have been possible without the willing assistance and inputs from these experts. Nonetheless, the analysis and conclusions presented in this report are the sole responsibility of the author.

Oslo, 04. september 2006

Stein Hansen

EXECUTIVE SUMMARY

Poverty reduction has not been a key direct goal of Norway's power sector aid.
During the past 25 years Norway has granted more than NOK 10 billion to power sector aid. However, relatively little is known regarding the effects and impacts of this aid. Poverty reduction is and has been the overarching goal for Norwegian and international development cooperation in general. However, it has not been reflected as a key direct goal of Norwegian power sector development cooperation.

Promotion of Norwegian interests have been central to Norway's power sector aid.
Norway's power sector aid has focused on promoting investments in power sector infrastructure and supporting technical assistance to transfer technological and institutional knowledge needed for the capital intensive power sector investments to enhance national economic growth and contribute to modernization of societies. For this purpose, tied aid, which Norway has strived to abolish among donor countries, was retained as practice for significant parts of Norwegian power and energy sector aid cooperation contrary to Norwegian aid policy and which has likely led to lower aid efficiency and effectiveness.

Macro-economic impacts of infrastructure and power sector development.
Countries with more developed infrastructure see a disproportionately greater impact of infrastructure on foreign direct investments (FDI) and domestic investments, and on growth. At the same time, countries with lower, underdeveloped infrastructure see no such growth impact. In other words, not only can a lack of infrastructure be an impediment to more investment, but it can also be one of the dimensions of the so-called poverty trap whereby a critical mass of infrastructure is needed to convince investors to make the decisions leading to sustained growth. This suggests that there are critical and interlinked infrastructure threshold levels that have to be reached before one can trace a growth and poverty reduction impact of infrastructure investments. Most African countries have yet to reach such infrastructure threshold levels

In places where the lack of power supply is identified as a key impediment to growth and removal of key obstacles to poverty reduction, the Norwegian broad-based power sector aid strategy may therefore be highly relevant and effective. At the same time, it must acknowledged that the countries Norway has selected as targets for such aid, belong to the most difficult ones in terms of achieving successful macro-economic development conditions for sustained growth and poverty reduction by means of relying on "trickle down" effects that such power sector aid entails.

Complementarity between different types of infrastructure.
There are important synergies and complementarities between different types of infrastructure. The partial contribution of electricity connections to growth and poverty reduction is enhanced if all year reliable roads are provided, and further enhancement is achieved if reliable telecommunications are in place. Welfare effects of access to multiple forms of infrastructure are thus greater than the sum of effects for each type of infrastructure individually.

Myths and realities as regards power sector impacts on livelihoods.
While energy is a basic necessity, electricity is not, as documented by the priorities set by both enterprises and poor households in developing countries. The often claimed health and

education benefits from provision of electricity to clinics and schools are by and large exaggerated. Energy is a relatively minor input into the production of health and education services and there exist close substitutes to electricity that will secure an adequate level of such services.

Women are key beneficiaries of the change in living and working conditions provided for by electrification. Many of their chores are very time consuming as a result of not having electricity access, and in addition, having electric power extends their daylight and provides for increased literacy, better income earning opportunities, and they become more independent and have a more of a say in household economic matters.

. Available household survey results for Africa suggest that:

> Users who are connected to a network do not have a major affordability problem,
> users who are not connected often do have a major affordability problem,
> the majority of the population is not connected to a utilities network,
> in rural areas, very few are connected,
> the population not connected tends to be among the poorest income groups, facing an affordability problem for utility services,
> in Africa the idea of relying on private operators concerned with full cost recovery without any subsidy component would be incompatible with network coverage expansion efforts.

Worldwide experience suggests that electricity for the poor require cross-subsidies between user groups preferably supplemented with extra-budgetary funding to provide connections at affordable costs to the poor. Where poor non-connected households are a large majority such cross-subsidization may be inadequate for financing access and use of the poor.

Connection fees tend to be much more critical for affordability than kWh tariffs since the poor tend to use very little electricity once they are connected.

The role of reliable power supply for business and enterprise development.
Lack of reliable and stable electrical power is one of the most important barriers to investment in new and productivity enhancing technology and machinery. Many African establishments have invested in own sources of power supply (e.g. diesel generators for back up) even if they are supplied by the public grid. This adds to the costs of operation. Outages and the risks associated with outages makes export oriented enterprises particularly vulnerable and the expected sales losses due to such unreliable power supplies can often be the factor that tips an investor's decision to a more reliable location. Reliable power supply is thus an important investor attractor and a growth enhancing and a poverty reducing factor.

The importance of involving stakeholders in reform processes.
Crucial to the success of such reforms is involvement of key stakeholders in the reform process and to allow whatever time is needed for local reform ownership to establish before its implementation. It is important to have an independent regulator in place before the commercialization of the utility is initiated so that good governance, transparency and whatever social considerations in the Poverty Reduction Strategy or other key policy documents can be properly adhered to when implementing the energy policy. Reform experience show that with a good reform process in place, ownership (private or public) of the power producer is not decisive for outcome, but autonomy to operate on commercial terms is.

However, getting active private owners "on board" can sometimes revitalize the utility and enhance efficiency beyond what a commercial public operator can achieve.

Why sector reforms risk failure.
Donor driven technical assistance in relation to electricity sector reforms risk costly failure when attempting to transfer rich country "best sector organization practice" onto poor developing countries with vastly different market, institutional and cultural settings. Independent reviews undertaken for a.o. the Asian Development Bank confirm this risk.

Experience with Norwegian "twinning" arrangements for technical assistance.
Independent reviews and evaluations of such "twinning" experience in Namibia, Nepal, Palestine, Mozambique and Uganda have established that these often fail in important respects due to:

> the supply-driven nature of reforms when done in a "twinning" context,
> resistance to change of status quo in many Southern institutions,
> the cultural- and communications barriers between foreign advisors and consultants on the one hand, and local management and staff, on the other,
> cost-inefficient set-up and implementation caused by lack of an open competitive process for selecting the best qualified supplier of such assistance,
> lack of performance monitoring indicators,
> poor and uninformative reporting and information on progress and problems, as well as financial statements

Such a critical focus is required even where "twinning" arrangements that Norway has entered into with poor partner countries have resulted in progress in areas of developing new legislation and regulation, concessions, procurement, and negotiating agreements with independent power producers, as well as training and capacity building of the local sister institution. Modern power sector legislation and regulation is now in place in many countries, but implementation and enforcement appear to lag far behind.

Norwegian support for training of local power sector staff has been a success.
A clear conclusion from this review is that training and capacity building – whether done in the form of on-the-site training, by sending counterpart staff for training at a Norwegian workplace of relevance, by enrolling local staff as students in a fellowship program, or providing for their participation in e.g. the international hydropower courses at the International Center for Hydropower – is overall positive.

Environment considerations continue to be donor driven conditionalities.
The recent World Bank Group evaluation of it's experience with private participation in the electricity sector during the 1990s concluded that there is huge untapped power sector potential for progressing beyond "*doing no harm*" to "*doing good*" on environment issues. For the most part, Environment Impact Assessments (EIAs) were not implemented and institutionalized in response to a widespread indigenous demand for better environmental management and protection, but instead they were donor driven and accepted by the recipients due to the donor conditionalities that such EIAs be produced. Lack of political will and vision is undoubtedly the biggest obstacle to making EIA effective in developing countries. There is insufficient political priority accorded to the environment in general, and EIA in particular. This lack of political will is unfortunately also allied to widespread greed-based corruption.

A serious lack of relevant indicators needed for impact monitoring and reporting in development cooperation characterizes Norwegian power sector projects.
This State of the Art Review has identified *a serious lack of monitoring and reporting of development-relevant impacts related to Norwegian and Nordic power sector projects*. One cannot exclude the possibility that this reflects a lack of basic understanding or plain ignorance of the key linkages between power sector development and the key dimensions of development more generally which development assistance is meant to promote.

In spite of the huge amounts of Norwegian and Nordic aid spent, the contribution of the power sector development assistance to economic and social development and poverty reduction is still unclear because good tracking of development and distributional impacts is rarely provided for in electrification studies.

Unlike the leading multilateral development banks that have developed methods focused on quantifying impacts and effectiveness of projects and institutional reforms, "with-without" or "before versus after" documentation has in most of the Norwegian institution building- and power project development assistance not been a key issue on the agenda. Proper baselines have either not been established at all, or the baseline information has been limited to direct effects often measured in the form of inputs rather than outcomes. Indirect- or multiplier effects of the investment/technical assistance in institution building is hardly ever attempted estimated in any systematic and structured way.

When appraising and assessing power sector development as a means to enhance the investment climate for business development, modernization and reduction of poverty, one has to distinguish between the impacts of:

> distribution network expansion,
> providing connections to poor households (roles of tenure and access to credit),
> what the electricity can be used for (new and existing work-related tasks, household-related tasks),
> the delivery terms (tariff level and –structure)

Experience worldwide reviewed in this report suggests that the growth and poverty reduction impacts of power supply expansion depend on:

> the income profile among affected stakeholders,
> simultaneous investments and upgrading of complementary infrastructures, which mutually enhances each others' performance and returns,
> well functioning institutions and regulatory authorities
> access to credit among the poor,
> sustained adequate maintenance practices

Challenges for the full power sector evaluation.
The full evaluation of Norwegian power sector aid should explicitly address these issues. As regards Norwegian – as well as Nordic – funded power projects in developing countries, the above lack of such relevant data and application of analytic methods for assessing net impacts is the rule and not the exception.

Future project- and policy preparation and design should take such considerations explicitly into account and make sure the cooperation contract has the resources available to secure proper and continuous monitoring so that the activity stays on the right track until completed.

A large share of the uncertainty surrounding the impacts of power- and other infrastructure projects and programs can be traced to the inadequacy of the available information about even the most basic social and environmental impacts. The data and indicators required to monitor them should be addressed at the pre-feasibility stage, when the various alternatives to be compared are identified.

Related to this is of course the (lack of) capacity and commitment of the recipient to cooperate to collect and monitor such comprehensive sets of data and indicators over an extended time period so as to make it possible to measure even long term impacts. The full evaluation will need to look into to what extent such capacity and commitment in fact has been adequately addressed when deciding the amount of complementary technical assistance for recipient institution capacity building to enable it to implement the project/program as designed and so that it's impacts can be traced and measured.

In all fairness, the Norwegian power sector aid cooperation should be evaluated against those guidelines and directives that were ruling the scenes at that the time projects and programs were initiated and implemented, and not against those that have been introduced after the aid agreements went into effect. The last two decades have displayed an awakening awareness and acceptance of the economy-wide effects and impacts of infrastructure projects and sector reforms. A consequence of this has been a steady development in how the project and program-specific social- and environmental effects shall be reflected in designs, appraisals and evaluations.

SUMMARY OF FINDINGS AND CONCLUSIONS

Purpose and Study Focus

The overarching goal of Norwegian development cooperation is to contribute to lasting improvements in economic, social and political conditions for the populations of developing countries, with special emphasis on ensuring that the assistance benefits the poorest people.

During the past 25 years Norway has granted more than NOK 10 billion on power sector aid. However, relatively little is known regarding the effects and impacts of this aid. The main purpose of this report is therefore to identify and assess which evaluation questions the coming power sector evaluation should focus on and their evaluability, by:

- Synthesizing findings in earlier reviews of Norwegian assistance to the power sector and recently published international reports,
- Assessing the Norwegian experience gained and results achieved, and
- Identify issues where information on effects is needed, and strengths/weaknesses in the existing monitoring and impact assessment system (including availability of data)

Overarching Norwegian Aid Goals vs Power Sector Aid

Poverty reduction is and has been the overarching goal for Norwegian and international development cooperation. However, it has not been a key direct goal of Norwegian power sector development cooperation.

Such aid has focused on providing for investments in power sector infrastructure and technical assistance to transfer technological and institutional knowledge needed for the capital intensive power sector investments to enhance national economic growth and contribute to modernization of societies.

In this context poverty reduction impacts have been assumed to result gradually in the form of "trickle down effects" resulting from new and more diverse job opportunities created by the improved investment climate and modernization of society caused by electrification.

Much Norwegian power sector aid has focused on reducing transmission and distribution losses and outages. Such activities have proven to be cost-effective and postponed the need for additional generating capacity.

The countries this aid is focused on are predominantly rural, sparsely populated, very low income, and characterized by poor governance. Initial grid access rates are very low, often close to zero in poor rural areas. Increases in connections and access as a result of electrification projects and institutional reforms have been low compared to what has been observed in Asia and Latin America. This is in part due to sparse population densities that imply very high connection costs.

Several Norwegian funded rural electrification projects have been implemented in poor areas, but rural electrification has not been the focus of Norway's power sector aid.

Furthermore, tied aid, which Norway has strived to abolish among donor countries, was retained as practice for significant parts of Norwegian power and energy sector aid cooperation.

The above characterizes Norwegian power sector aid to this date, even if poverty reduction is now listed among the six challenges related to Norwegian power sector development cooperation presented by a Norad-appointed Task Force at the end of 2005.

These unique characteristics of Norway's power sector aid become even clearer when comparing the 2005 power sector development aid strategies of Norway and Sweden. Whereas the Sida strategy is entitled "*Policy for sustainable energy services for poverty reduction*", the comparable strategy prepared by the Norad appointed working group is titled (in English translation) "Proposal for *strategy and actions for the promotion of the Norwegian assistance in the power sector in developing countries*[1]".

Macro-economic Impacts of Infrastructure and Power Sector Development

Economic growth is endogenous. This means that growth levels are driven by the composition of public expenditures – including the infrastructure investments – but at the same time, public expenditures – including infrastructure investments are driven by economic growth. This "State of the Art" literature review has concluded that:

- Countries with more developed infrastructure see a disproportionately greater impact of infrastructure on foreign direct investments (FDI) and domestic investments and on growth.

- At the same time, countries with lower, underdeveloped infrastructure see no statistically significant impact of infrastructure investment on growth. In other words, not only can a lack of infrastructure be an impediment to more investment, but it can also be one of the dimensions of the so-called poverty trap whereby a critical mass of infrastructure is needed to convince investors to make the decisions leading to sustained growth.

- This suggests that there are critical and interlinked infrastructure threshold levels that have to be reached before one can trace a growth and poverty reduction impact of infrastructure investments. Most African countries have yet to reach such infrastructure threshold levels

- Understanding this helps to explain why it has been difficult to detect any significant correlation between infrastructure provision and growth in Africa. This may also help explain why donor for a period since the early 1990s decided to reduce their priority on infrastructure investments in development cooperation.

- Adding to this threshold level are institutional capacity constraints and infrastructure market distortions observed, particularly in African countries. Recent "engines of growth" studies also show convincingly that during the 1970-1990 period, over 50% of the variation in per capita economic growth in Africa is explained by institutional variables, and not by the volume of physical investments.

- A comprehensive review based on national macro-data for the 1960-1997 period clearly shows more infrastructure stocks are associated with higher growth rates.

[1] The Norwegian title is "Forslag til strategi og tiltak for å fremme norsk innsats I kraftsektoren I utviklingslandf". Innstilling av arbeidsgruppe nedsatt av Utenriksdepartementet. Oktober 2005"

Counterfactual studies conclude that: Had Africa had East Asia's growth rate in telephones per capita (10% versus 5%) and in electricity generation (6% versus 2%), then Africa's per capita growth rate would have been almost 1% higher.

- The clear message from this research is that there will be very little growth and no significant poverty reduction in Africa without a major improvement in the level and state of infrastructure.

- The scope for improved cost-efficiency in power generation in Africa is significant. Operators could improve their performance 15%, and better demand side orientation provides for another 24% improvement due to scale economic savings potentials. Realising such savings would facilitate lower tariffs and make power affordable to more users, provide more financial resources for expanding the supply and network of transmission and distribution, and/or reduce the drain on the State budget caused by power sector subsidies, and thus free up financial resources for uses in other public sectors with pressing needs.

- Therefore, support to infrastructure in Africa will require not only commitment to finance constructions, but commitment is also critically needed to help establish and sustain the necessary institutional changes and legislative and regulatory reforms that provide for the physical infrastructure to deliver infrastructure services in reliable and cost-efficient ways.

- While the time it takes to complete the physical construction may seem long, it is often short compared to the time needed to undo wrong institutional arrangements and associated incentives while trying to rebuild those needed to ensure the long-term viability of the investment. This interlinked infrastructure/institution reform challenge has been underestimated in the past, in particular as regards Africa.

- The experience of P.R. China during the last two decades has been that in areas with limited natural resources for agricultural expansion, and where the population carrying capacity of soils and water is virtually exhausted, it is the ability to migrate that determines the extent to which they are able to escape poverty and contribute with remittances back to their origin. This ability to migrate is due to (i) the many jobs created by the sustained rapid economic growth in China, (ii) the emergence an integrated labour market nationwide, and (iii) easy access to information about job opportunities arising from already having relatives and friends outside the village and province who have migrated earlier.

- Expressways have had a strong indirect impact on poverty reduction because of the critical role the investments in establishing the National Trunk Highway System has had in removing bottlenecks to the sustained high rate of sustained economic growth in China. This is the underlying factor that created the new jobs in the coastal and central areas and thus made such large scale migration possible. From this macro-economic perspective, investing in expressways as a means to create a climate for workplace investments that facilitates migration from poor growth-constrained communities could be a highly cost-effective poverty reduction project, even if it contains no explicit geographically placed poverty reduction component.

- Analogous to this "trickle down" development effect of building a national trunk highway system is *the effect of national trunk transmission of power* to those areas where the potential for creating new competitive economic activities is present, provided adequate and reliable power supply is provided. China has identified adequate power supply as a critical growth factor in line with- and mutually reinforcing the role of the national trunk highway system. Seen from this perspective one may argue that power plants and transmission systems represent key engines of economic growth, job creation and opportunities for sustained poverty reduction.

- However, in areas where the natural resource conditions, population densities and agro-cultural practices combine to suggest a considerable underutilized carrying capacity of the land, the poverty reduction impacts from improved rural roads to supply all-year reliable and smooth transport can be significant, and further enhanced if reliable power supply and telecommunications are provided at the same time. In these areas, good infrastructure were critical to attracting commercial firms to engage in contract farming, because such firms have a choice between locations, and communities without good road access and infrastructure end up as losers because the time losses, higher transport costs and uncertain access could impose severe losses on the commercial companies.

- Electrification used to be seen as a major driving force for development. Recent research suggests that a more cautious view should be adopted whereby electrification should be viewed as an enabling factor rather than a direct cause. This also applies specifically for rural electrification. From the perspective of development, rural electrification may well accelerate growth, but this is not necessarily the same as saying that it is a precondition for rural economy "take-off" into the growth and modernization process.

- However, a direct consequence of the prevailing poverty and low electrification even in urban areas in countries where Norwegian power sector aid is focused, there is limited scope for tariff-revenue-based cross subsidization between urban better off users and rural poor users. This adds to challenge of reaching the rural poor with electricity at affordable tariffs.

- However, the Chinese macro-economic trickle down experience as a basis for poverty reduction is not automatically transferable to a no-growth African setting where much of the Norwegian power sector aid has been channeled. However, it points to an important finding which is that direct allocation of aid funds to poor stakeholders may not always be the most cost-effective way of helping the out of poverty on a sustained basis. From this perspective the Norwegian power sector aid strategy may – under circumstances as illustrated in the Chinese study – be fully compatible with the overarching strategic poverty reduction aid objectives.

- In places where the lack of power supply is identified as a key impediment to growth and removal of key obstacles to poverty reduction, the Norwegian broad-based power sector aid strategy described above may therefore be highly relevant and effective. At the same time, it must acknowledged that the countries Norway has selected as targets for such aid belong to the most difficult ones in terms of achieving successful macro-economic development, sustained growth and poverty reduction by means of relying on "trickle down" effects that eventually will benefit the poor.

Important Complementarity with other Investments and Policy Reforms

Providing a combination of infrastructure services, such as electricity, water, sanitation, and telephones, has a greater impact on economic activity and poverty reduction than providing a single service. More specifically, the provision of a second complementary service is important, but much more significant is the provision of a third or fourth service. In fact, adding the fourth service could bring welfare improvements that are seven times greater than those delivered by the second service. Comprehensive empirical studies show that:

- There are important synergies and complementarities between different types of infrastructure. The partial contribution of electricity connections to growth and poverty reduction is enhanced if all year reliable roads are provided, and further enhancement is achieved if reliable telecommunications are in place. Welfare effects of access to multiple forms of infrastructure are thus greater than the sum of effects for each type of infrastructure individually.

- There are strong complementarities between close proximity of households to roads and telephone access, which is consistent with a reduction in transaction costs and easy access to markets. Similar positive complementarities were identified with electricity.

- In Bangladesh access to a telephone was shown to increase per capita monthly expenditure of poor households to 12 Taka. However, if the poor household has access to both telephone and better roads, its expenditure increases to 89 Taka. If in addition, the household has access to electricity, it increases to 185 Taka.

- Among the three infrastructure types, electricity appears to have the highest individual impact in this particular Bangladesh study. Returns are higher, however, when access to household electricity is combined with access to paved roads and public phones.

- The sole effect of roads and phones is modest, but their impact increases considerably when combined with other forms of infrastructure, i.e. electricity.

Electrification Effects on People's Life

Impacts on users of access to electricity materializes in the form of:

- freed up time now available for work, education and family life,
- extended daytime for indoor productive and leisure activities,
- reduced likelihood of drop out from schools,; more girls complete education
- increased literacy, especially among females,
- increased access to information and knowledge from TV and radio,
- possibility for refrigeration and freezing of foods,
- enhanced labour productivity and broadened job and income opportunities,
- enhanced information on importance of hygiene,
- fertility, birth rates, and infant mortality is reduced,
- improved access to potable water,
- reduced pressure on natural resources and the labour market

The extensive micro- and meso-level studies undertaken among enterprises and households world-wide under the joint World Bank/UNDP ESMAP Program during the past couple of decades has provided valuable insight into myths and realities as regards impacts of power sector development on households and enterprises.

- While energy is a basic necessity, electricity is not, as documented by the priorities set by both enterprises and poor households in developing countries.

- The often claimed health and education benefits from provision of electricity to clinics and schools are by and large exaggerated. Energy is a relatively minor input into the production of health and education services and there exist close substitutes to electricity that will secure an adequate level of such services.

- Women are key beneficiaries of the change in living and working conditions provided for by electrification. Many of their chores are very time consuming as a result of not having electricity access, and in addition, having electric power extends their daylight and provides for increased literacy, better income earning opportunities, and they become more independent and have a more of a say in household economic matters.

The Incidence of Costs and Benefits: Effects on the Poor

Even though direct poverty reduction has not been a primary goal of Norwegian power sector aid, it is of interest to note what has been established internationally as regards power sector development as a means to reduce poverty.

- As regards network electricity access rates across income quintiles, matters have improved for the all income groups but the lowest quintile, with the largest percentage gain for the middle income group. The lowest income classes had zero average access rate both prior to reforms in 1990 and also10 years later.

- World Bank studies show that the poor are often the last to benefit from increased access under the Private Sector Development in Electric Power (PSDE) reforms. They tend to be overlooked because private operators are reluctant to serve low-income clients given that these markets are not financially viable on a freestanding basis.

- However, the impacts of these reforms on the poor in Africa is difficult to quantify, in part because in most cases the reforms are not complete, or they have not been implemented as designed. Limited progress with reform can in several cases be attributed to unrealistic expectations or inappropriate reform design.

- The main conclusions from the review of Nordic and Norwegian power sector projects in Africa and Asia are in line with the above conclusions from the international literature, but due to poor ex ante – ex post data coverage on key performance and impact indicators, the conclusions are more anecdotal.

- Disappointing results are also due to ineffective design and implementation of much needed institutional reforms, and poor governance.

- When reforms involve adjusting tariffs upwards to cover costs, poor households (both urban and rural) tend to be adversely affected, at least in the short run.

Affordability is Crucial for Reaching Users: Connection Fees and Use Tariffs

As regards affordability, it has been estimated in non-African countries that electricity consumption takes up about 4% of household incomes on the average, and decreases across income quintiles. Available household survey results for Africa suggest that:

> Users who are connected to a network do not have a major affordability problem,
> users who are not connected often do have a major affordability problem,
> the majority of the population is not connected to a utilities network,
> in rural areas, very few are connected,
> the population not connected tends to be among the poorest income groups, facing an affordability problem for utility services,
> in Africa the idea of relying on private operators concerned with full cost recovery without any subsidy component would be incompatible with network coverage expansion efforts.

- Worldwide experience suggests that electricity for the poor require cross-subsidies between user groups preferably supplemented with extra-budgetary funding for providing connections at affordable costs to the poor.

- Connection fees tend to be much more critical for affordability than kWh tariffs since the poor tend to use very little electricity once they are connected.

- Stakeholder impacts of electricity tariffs have only been carefully analysed in a handful of cases and none in Africa.

- Available evidence suggests that it is important to establish how much electricity the poor actually consume and then set a ceiling at that level. Above that ceiling power tariffs shall be high enough to subsidize the deficit incurred by the low social tariffs paid by the poor. If this is done based on accurate data and careful planning one can – if there is political willingness - significantly reduce the need for budget subsidies, and reduce the:

  > *Errors of inclusion*, defined as the percentage of the electricity subsidy beneficiaries who are not poor,
  > *Leakage rate*, reflecting the proportion of the total subsidy expenditure that flows to the non-poor, and
  > *Errors of exclusion*, defined as the percentage of the poor who are not subsidy beneficiaries.

- With good socio-economic stakeholder data it is possible to calculate the optimal combination of user tariff subsidies and connection subsidies to minimize errors of inclusion, errors of exclusion, and leakage rates, and free up budget allocations for other uses. Implementation of such social tariff ceiling adjustments on the other hand, remains to be seen.

But Reliable Power Supply Matters more to Enterprises

The review of studies and evaluations of development impacts of investments in the power sector, including reform implementation, suggests that:

- The lack of reliable and stable electrical power is one of the most important barriers to investment in new and productivity enhancing technology and machinery. A significant number of establishments in African countries have invested in own sources of power supply (e.g. diesel generators for back up) even if they are supplied by the public grid. Having invested in such backup adds to the costs of operation because outages and the risks associated with outages makes export oriented enterprises particularly vulnerable and the expected sales losses due to such unreliable power supplies can often be the factor that tips an investing decision to a more reliable location. Reliable power supply is thus an important investor attractor and through that it becomes growth enhancing and a poverty reducing factor. This effect is particularly strong as regards foreign investors, since domestic enterprises more often supply local markets and are thus less exposed to international competitors.

- In communities with electricity, a higher percentage of household heads were employed in non-farm activities and in the secondary and tertiary sectors compared with villages without electricity. This observation is compatible with the plausible assumption that both direct and indirect employment may result from the availability of electricity, since electricity is an important input in the development of many secondary and tertiary activities.

- Electrification in itself is not the key factor in development even if it certainly can be observed to shape and influence the development process as it occurs. To take advantage of electricity provision, farmers and non-farm enterprises must have sufficient income to buy the appliances and implements that use electricity. Such levels of income must have been established as a result of other development processes prior to rural electrification.

- Entrepreneurs and farmers, for example, will not invest in such electricity driven output enhancing implements unless there is sufficient market demand within reach for their increased produce. It is important to note that electricity and energy supply constitutes but a small portion of overall investments and input services needed to meet such increased output demands.

- "Trickle down" effects of power sector reforms have indeed been observed in e.g. Ghana, South Africa and Mali, where it is documented that reliable electricity supply has led to establishment of new power-based small scale enterprises as diverse as welding, sewing, telecommunications, bread making, ice making, battery charging and hair dressing,

- Even so, there is little evidence to suggest that power price reforms have had a significant impact on economic growth. These reviews also suggest that industrial willingness to pay is generally high, given the level of other input prices and the high cost of un-served demand.

Conditions for successful Power Sector Reforms

The two key market reform dimensions in the power sector are (i) establishing an independent regulatory agency (IRA), and (ii) providing for independent power producers (IPP). Access rates to electricity in Africa have increased almost twice as fast for countries that adopted one or both reforms as compared to those countries that had not adopted any of these reforms, and

countries that adopted both reforms experienced that fastest access rate improvement. With regard to impacts of power sector reforms, this State of the Art Review has established that

- Crucial to the success of such reforms is involvement of key stakeholders in the reform process and to allow whatever time is needed for local reform ownership to establish before its implementation..

- It is important to have an independent regulator in place before the commercialization of the utility is initiated so that good governance, transparency and whatever social considerations in the PRSP or other key policy documents can be properly adhered to when implementing the energy policy.

- Reform experience show that with a good reform process in place, ownership (private or public) of the power producer is not decisive for outcome, but autonomy to operate on commercial terms is. However, getting active private owners "on board" can sometimes revitalize the utility and enhance efficiency beyond what a commercial public operator can achieve.

Reasons for Power Sector Reform Failures

Designing and implementing power sector reforms that imply considerable changes in political power and established privileges of influential market actors, is a very demanding task in any country, and not the least in poor developing countries characterized by lack of transparency, widespread abuse of power and authority and a culture of personal and stakeholder group inter-relationships that are quite different from those in the donor countries. This various reports forming the basis for this State of the Art Review has led to the following conclusions as regards reasons for failed- or less successful reforms:

- Donor driven technical assistance in relation to electricity sector reform in **Uganda** illustrates the difficulties encountered when attempting to transfer rich country "best sector organization practice" onto poor developing countries with vastly different market, institutional and cultural settings. Reform design failure becomes a tempting conclusion.

- A recent review of the power sector reforms in **Kenya** and **Uganda** concludes first that the amended electricity acts do not sufficiently address the issue of the electrification of the poor. Secondly, the utilities, Ministries of Energy, and regulatory agencies make no attempt to track electrification of the poor. Thirdly, the sequence of power sector reform measures appear to have been detrimental to electrification of the poor. Fourthly, the reforms also appear to have failed to link rural electrification to the overall strategy of improving the performance of the electricity industry.

- The Asian Development Bank (ADB) study in 2003 on improving effectiveness of its advisory technical assistance (ADTA) in China to finance institution building, plan formulation and/or implementation, found that ADTAs

  > often did not address critical issues because they were "supply driven" by ADB
  > failed to involve key decision makers in topic selection, or
  > failed to design ADTAs within a strategic longer term program of support
  > design, including preparation of ToR, was usually dominated by ADB, and lacked Government ownership.

- Many advisors/consultant engaged in such ADTA contracts were found to lack familiarity with the country in which to help with institution building.

- In other words, the shortcomings identified by ADB's review of its own performance is a useful reminder and baseline for assessing the effectiveness, outcome and impact of Norwegian institutional cooperation agreements, e.g. "twinning agreements" with local power sector institutions.

The Experience with Norwegian "Twinning" arrangements

17.4% of the Norwegian power sector aid during 1999-2004 has been for "Energy Policy and Administrative Planning". The policy has been for Norad to be responsible for funding and coordination of projects, with the cooperating public institutions in the South and Norway being responsible for planning, implementation and reporting. Such cooperation – for short often referred to as "Twinning" – is seen to provide the recipient with a broad range of competence and services through "sister" institutions with a comparable mandate. Such "Twinning" arrangements have played a key role in Norwegian aid in the energy sector at large and in the electricity sector.

This State of the Art Review of reports addressing the experience from Norwegian institutional power sector institutional aid cooperation by means of "twinning" arrangements concludes that:

- The various "twinning" arrangements that Norway has entered into with poor partner countries have resulted in progress in areas of developing new legislation and regulation, concessions, procurement, and negotiating agreements with independent power producers, as well as training and capacity building of the local sister institution. Modern power sector legislation and regulation is now in place in many countries, but implementation and enforcement appear to lag far behind.

- However, the countries selected for such aid cooperation are among the most difficult in terms of achieving successful development results, regardless of sector. Embarking on such "twinning" arrangements with government institutions in such countries must therefore be seen as a challenging and high risk endeavour.

- The "best practice" arrangements found in Nordic- and other developed countries hardly ever fits the needs of poor developing countries. Attempts at introducing such arrangements tend to overshoot, and fail to address the local needs in ways that are compatible with available capacity even after considerable training and capacity building efforts have been completed.

- Independent reviews and evaluations of such "twinning" experience in Namibia, Nepal, Palestine, Mozambique and Uganda have established that these often fail in important respects due to:

  > the supply-driven nature of reforms when done in a "twinning" context,
  > resistance to change of status quo in many Southern institutions,
  > the cultural- and communications barriers between foreign advisors and consultants on the one hand, and local management and staff, on the other,
  > cost-inefficient set-up and implementation caused by lack of an open

competitive process for selecting the best qualified supplier of such assistance,
> lack of performance monitoring indicators,
> poor and uninformative reporting and information on progress and problems, as well as financial statements

- This again has – perhaps unsurprisingly - resulted in ineffectiveness, inefficiency and less than planned development impacts. The reviews examined as a basis for this State of the Art Review appear to diagnose the reasons for such outcomes to the following:

  > Norwegian "sister" institutions in "twinning" agreements sometimes place long term advisors with limited relevant experience in the recipient institution, where the recipient sometimes do not know for what the expatriate expert shall be used.
  > the procedure for selection of Norwegian "sister" organization and its staff to be sent abroad is not based on and controlled by an open tender process. Instead it is a supply-driven process protecting the Norwegian state institution from cost-effective competition.
  > Such institutional "twinning" agreement contracts appear to be rather costly due to inflated activities and budgets caused by the lack of competitive bidding,
  > Unlike international consulting firms, the Norwegian "sister" organizations have limited developing country experience in managing contracts where their task is to locate, hire and monitor a range of specialists with complementary expertise. In fact, the Norwegian public "sister" organizations are more often users of such independent consultancies than supplier of them.

- This Norwegian institutional cooperation deficiency is not unique to power sector aid cooperation. Similar findings of poorly targeted and wasteful Norwegian use of development financing resources are appearing from such "twinning" arrangements in the road sector as well.

Training, Capacity Building and Technology Transfer

Training, capacity building and technology transfer have been key elements in Norwegian power sector aid. They have played key roles both in relation to physical investments in power plants and transmission lines, and an integral part of aid to facilitate sector reforms and institution building. Based on this review of reviews and evaluations of the implementation a sample of Norwegian such development cooperation agreements on reaches the following conclusion:

- Such training and capacity building – whether done in the form of on-the-site training, by sending counterpart staff for training at a Norwegian workplace of relevance, by enrolling local staff as students in a fellowship program, or providing for their participation in e.g. the international hydropower courses at the International Center for Hydropower – is overall positive.

High Costs of Rural Electrification: Are Off-Grid Options the Solution?

High costs of new connections and rural electrification as well as the cost of use of electricity remain crucial challenges when trying to expand electrification coverage in poor countries with sparsely populated rural areas. This State of the Art Review finds that:

- The reasons which make grid supplies unfeasible, such as remoteness, low level of commercial energy demand and lack of local spending power, work equally strong against off-grid options as for grid-based extensions. If off-grid options are to succeed, they need to meet the same stringent success criteria as conventional options.

- In many cases there is considerable scope for effectiveness- and efficiency improvements because:

  > Costs can be significantly reduced by modifying designs relative to inherited excessive standards often imposed by donor organizations,
  > Administrative costs can be reduced by applying innovative billing- and metering methods adapted to the local setting,
  > Construction costs can be reduced by choosing local materials and intermediate voltage levels for local distribution,
  > Off-grid options such as small diesel generators, micro-hydropower, solar home systems, photovoltaic technologies, biogas-, wind-power-, and LPG-based solutions can in many case be the cheapest local alternative for a long time to come,
  > Involving local communities and NGOs in the development and implementation of such projects is crucial to successful project implementation and sustainable operation.

- Norwegian and Nordic projects have actively contributed with innovative cost-reducing solutions along the above lines in Asian and African electrification projects.

Environmental Impact Assessment

Environmental impact assessment of power sector development cooperation projects and the challenge of establishing local understanding of its importance for sustainable development remains a key challenge for actors in the power sector. This State of the Art Review finds that:

- The recent World Bank Group evaluation of it's experience with private participation in the electricity sector during the 1990s concluded that there is huge untapped power sector potential for progressing beyond "*doing no harm*" to "*doing good*" on environment issues.

  >For one, even within contractual constraints, project managers' ability to achieve least-cost and environmentally responsible dispatch of the system's power plants is considerable through the use of the right technology and the appropriate use of plant alternatives.
  >Second, projects can be more environmentally friendly by going beyond the delineated fence line that the industry tends to practice, e.g. by looking into the most environment- and health-friendly corridors for transmission lines, and/or environment- and safety focused transport solutions for getting the fuel to power plants.

- Environment is defined as one of the six sustainability elements. While Norway has no legal requirement to consider potential environmental effects of the aid programme, Norad has repeatedly reaffirmed its commitment to evaluate the environment impacts of all development cooperation activities.

- With the publication of the new and revised "Development Cooperation Manual", Norad has mainstreamed environmental issues so that these are addressed as part of the assessment of risks and sustainability. It focuses on initial screening of legal and policy framework and national EIA standards. Furthermore, it focuses on monitoring and implementation issues, beneficial and adverse environmental impacts, off-site effects, impacts on local populations, and mitigation measures. Finally, it prescribes comparison with alternative approaches and the consequences of these and of discarding the programme. The latter can be seen as a variation of the counterfactual or "do nothing" alternative, and requires a completely new and wider approach to data collection and analysis throughout the entire project cycle, including post completion years as a basis for assessing long-term effects. It is expected that the guidelines will be continuously updated and improved in line with similar updates internationally.

- Unsurprisingly, EIA in developing countries - even though such procedures were first observed in some such countries in the mid-1970s – varies significantly from country to country in terms of interest, commitment, local ownership and capacity and willingness to deal with environmental and social impact issues. It's performance generally falls far behind that of EIA in developed economies,

- The organisations responsible for implementing IEA provisions in such countries are often new, lacking in status and political clout, and working in a culture where an absence of information-sharing considerably reduces their influence. Environment Ministries are bypassed by other, more powerful, ministries.

- For the most part, such EIAs were not implemented and institutionalized in response to a widespread indigenous demand for better environmental management and protection, but instead they were donor driven and accepted by the recipients due to the donor conditionalities that such EIAs be produced.

- A consequence of this is that some developing countries have in place two classes of programs from a safeguard perspective; one strict one which is applicable to projects financed by strict donors and the multilateral finance institutions (MFIs), and another applicable to domestic projects.

- Lack of political will and vision is undoubtedly the biggest obstacle to making EIA effective in developing countries. There is insufficient political priority accorded to the environment in general, and EIA in particular. This lack of political will is unfortunately also allied to widespread greed-based corruption.

Challenges for the Full-scale Power Sector Evaluation

The Lack of Monitoring and Reporting of Development-relevant Impacts

This State of the Art Review has identified *a serious lack of monitoring and reporting of development-relevant impacts related to Norwegian and Nordic power sector projects*. One cannot exclude the possibility that this reflects a lack of basic understanding of the key linkages between power sector development and the key dimensions of development more generally which development assistance is meant to promote. As a result, one has to conclude that:

- In spite of the huge amounts of Norwegian and Nordic aid spent, the contribution of the power sector development assistance to economic and social development and poverty reduction is still unclear because good tracking of development and distributional impacts is rarely provided for in electrification studies.

- The actual demand, affordability and willingness to pay for electricity by industry and private business (including farming and agro-processing) is poorly mapped and understood. It often seems as if project justification assume that grid-based electric power has no close substitutes for powering many of the activities of many small- and medium- sized enterprises. Establishing the net development effects of electrification require proper mapping of the alternative investment options.

- Better indicators reflecting different households' and enterprises' actual energy demand and ability and willingness to pay for access and consumption is needed so that power projects and policies can be identified and designed more carefully. Better indicators can enhance performance tracking and the conceptual basis for more relevant pro-poor energy interventions needs improvement.

- Unlike many of the international studies that have focused on quantifying impacts and effectiveness of institutional reforms, "with-without" or "before versus after" documentation has in most of the Norwegian institution building- and power project development assistance not been a key issue on the agenda. In some cases one has conducted random interviews among stakeholder to superficially assess the possible role of the project in facilitating and encouraging establishment of new industries and economic activities.

- However, proper baselines have either not been established at all, or the baseline information has been limited to direct effects often measured in the form of inputs rather than outcomes. Indirect- or multiplier effects of the investment/technical assistance in institution building is hardly ever attempted estimated in any systematic and structured way.

- Systematic collection of socio-economic data for control areas/-situations as a basis for counterfactual analysis of the impact and effectiveness of the cooperation has not at all been the rule. Without designing for such counterfactuals and baselines, there has not been much focus on monitoring during and after completion. As a result, there is very limited quantitative evidence available for assessing effectiveness, efficiency and impact of the Norwegian support in this field, and thus little evidence from Norwegian aid to this sector to draw on as lessons for future such collaboration.

- Experts with extensive involvement in such Norwegian aid confirm to this State of the Art Report that when assessing the utility or value of such projects and institutional cooperation, the focus has been on remedying urgent obvious shortcomings, such as the value of increased power sales (both old and new customers), and of reduced outages, transmission and distribution losses.

- Infrastructure projects have to be evaluated over an extended time frame to capture both the short term peak effects and the long run- and more stable lasting effects on economic activity as well as on the social fabric and the environment.

- Unfortunately, it rarely happens that an aid recipient country will accept to spend resources (even grants have opportunity costs) on post-completion monitoring and evaluation of long term effects, and donors have not done much to insist on providing for establishing such understanding when contracts for donor funded infrastructure projects have been signed. As a result, we still have only rather limited empirical knowledge of project- and policy reform impacts beyond the completion date.

Some key issues for the upcoming power sector evaluation

The drafting of ToR for the upcoming power sector evaluation must be seen in light of the following:

- During the 1950s, 1960s and 1970s when many of the large power sector projects were planned and implemented, detailed analysis of stakeholder impacts, and among these, the impacts on the poor, were not part of the appraisal agenda. As a consequence, socio-economic development impact indicators and monitoring of these were largely absent. Post evaluation of such impacts could therefore not be very sophisticated, and often only anecdotal.

- Due to the very long lead time and operation period of power sector projects, even today little is known about the impact of investments and institutional power sector reforms on the poor because data have not been gathered systematically. However, this is not unique for Norwegian funded projects. Based on a review of 154 projects, the World Bank found that Bank project documents provide very little data to evaluate the impact of power sector reforms on stakeholders. The shortcomings identified relate to:

  (i) shortage of appropriate data and information needed to reliably measure impacts and their distribution among stakeholders, and
  (ii) incomplete understanding of processes, causes and effects (one- or two way causalities) and on methods for measuring direct and indirect stakeholder impacts.

- Available data tend to be anecdotal and not based on sound monitoring and evaluation systems, or empirical evidence. Many opportunities for learning about such impacts and distributional effects were missed when reforms were designed and implemented in the 1990s because socio-economic indicators for tracing distributional effects, and environmental guidelines and criteria had been developed first and foremost for investment projects and only gradually did the focus widen to include concerns about how policy reforms affected different stakeholder groups.

- Much of the recent (since the turn of the Millennium) ESMAP analytic work, and methodology development by a.o. the World Bank, ADB and IFPRI reviewed in this State of the Art report is designed to remedy these lost opportunities, and recent empirical findings have vastly improved and clarified our understanding of important linkages of direct policy relevance.

- As a result, it is increasingly understood and taken into account in the project cycle that many power sector projects have very long lead times, and that guidelines and directives may have changed significantly during the lifetime of a project.

- When appraising and assessing power sector development as a means to enhance the investment climate for business development, modernization and reduction of poverty, one has to distinguish between the impacts of:

  > distribution network expansion,
  > providing connections to poor households (roles of tenure and access to credit),
  > what the electricity can be used for (new and existing work-related tasks, household-related tasks),
  > the delivery terms (tariff level and –structure)

- Experience worldwide reviewed in this report suggests that the growth and poverty reduction impacts of power supply expansion depend on:

  > the income profile among affected stakeholders,
  > simultaneous investments and upgrading of complementary infrastructures, which mutually enhances each others' performance and returns,
  > well functioning institutions and regulatory authorities
  > access to credit among the poor,
  > sustained adequate maintenance practices

- Evaluation of Norwegian power sector aid should explicitly address these issues.

- As regards Norwegian – as well as Nordic – funded power projects in developing countries, the above lack of such relevant data and application of analytic methods for assessing net impacts is the rule and not the exception.

- Power sector projects take a long time to plan, pass through the decision-making process, organize and implement. The impacts of such projects begin to occur as early as at the project identification stage when rumors about a possible project begin to circulate the affected communities. Project impacts may occur long after the project is completed. No wonder therefore that one and the same project may live through generational shifts in terms of how planners, decision makers, NGOs and affected parties view the effects and impacts of such projects.

- A large share of the uncertainty surrounding the impacts of power- and other infrastructure projects and programs can be traced to the inadequacy of the available information about even the most basic social and environmental impacts. The data and indicators required to monitor them should be addressed at the pre-feasibility stage, when the various alternatives to be compared are identified.

- Related to this is of course the (lack of) capacity and commitment of the recipient to cooperate to collect and monitor such comprehensive sets of data and indicators over an extended time period so as to make it possible to measure even long term impacts. The full evaluation will need to look into to what extent such capacity and commitment in fact has been adequately addressed when deciding the amount of complementary technical assistance for recipient institution capacity building to

enable it to implement the project/program as designed and so that it's impacts can be traced and measured.

- In all fairness, the Norwegian power sector aid cooperation should be evaluated against those guidelines and directives that were ruling the scenes at that the time projects and programs were initiated and implemented, and not against those that have been introduced after the aid agreements went into effect. The last two decades have displayed an awakening awareness and acceptance of the economy-wide effects and impacts of infrastructure projects and sector reforms. A consequence of this has been a steady development in how the project and program-specific social- and environmental effects shall be reflected in designs, appraisals and evaluations.

Future project- and policy preparation and design must take such considerations explicitly into account and make sure the cooperation contract has the resources available to secure proper and continuous monitoring so that the activity stays on the right track until completed.

The two leading multinational development finance institutions (The World Bank and the Asian Development Bank (ADB)) have developed and applies counterfactual impact assessment methods in which data is collected for the entire project cycle and at such a level of detail that the distributional impacts of interest from a poverty reduction effectiveness perspective can be assessed. An approach recently developed at ADB is presented in chapter 9 in this State of the Art Report. If such impact assessment is considered important when trying to establish the effectiveness and impact of Norwegian development cooperation, one cannot claim that methods for conducting such studies are not available.

1. INTRODUCTION AND BACKGROUND

1.1 Background

Norway has been engaged for many years in cooperation in the power sector, having used more than NOK 10 billion in total during the last 25 years. The cooperation has included more than 70 countries and a broad cross-section of the sector. Establishing competence and capacity for government entities to strengthen their role in management of the sector, and developing infrastructure, have been important issues.

A working group established by the Ministry of Foreign Affairs (MFA) has now proposed a strategy and subsequent actions for significant increased cooperation in the power sector, with emphasis on the contribution to economic development and reduction of poverty. Building of institutional competence and capacity, and good governance will be key issues also in the new activities, in addition to due consideration of environmental and social impacts.

As a basis for formulating this strategy, Norad intends to perform a comprehensive, but focused evaluation of the Norwegian cooperation in the power sector up to now. An important objective will be identification and documentation of the results of Norwegian assistance in the power sector, and especially of the long-term effects. The emphasis on long-term impacts are partly based on the fact that planning and implementation of power development efforts most often are long-term activities, and that important economical, social and environmental impacts will also last for a long time. But many impacts will probably also be visible only long after the activities have been finished because of long cause and effect chains. There is very little knowledge about the long-term effects to base policy and guidelines on, and a clear need for better documentation of the results.

For this reason, Norad has requested a State of the Art study which shall provide the basis for a relevant and effective Terms of Reference (TOR) for the comprehensive, but still focused evaluation of effects of Norwegian assistance to the power sector. This evaluation shall include not only hydropower but other forms of energy (except oil and gas). Assistance in the power sector covers energy policy, planning and management/administration of power supply and transmitting/distribution, energy and water resource related studies, and the development/operations of energy facilities. The State of the Art study will identify issues where more insights are needed and their evaluability will be assessed.

1.2 Mandate of the Assignment

This State of the Art study is limited to development assistance in the power sector. It is not mandated to include support to address global environment issues such as global climate change. The main purpose is to identify and assess which evaluation questions the coming evaluation should focus on and their evaluability.

By scrutinizing and summarizing the experiences and results documented in existing review- and evaluation reports, it will be easier to decide which issues will be most important in the following evaluation. The State of the Art study will especially look for the influence on communities, institutions, industries, households and the environment by power development itself, the distribution net, energy use and supply conditions, and also water resource planning and management.

The objectives of this study are to establish a state of the art report on the effects of such assistance, and the quality of impact assessment reports/systems and data, by:

- Synthesis of findings in earlier reviews of the Norwegian assistance to this sector and in recent international evaluations/studies, including direct/indirect and short/long-term effects on local, national and regional level, and synergetic effects with other infrastructure developments
- Assessing the quality of Norwegian review/end-reports and the Norwegian assistance in this sector according to relevance, effectiveness, efficiency, impact and sustainability.
- Assessing recent international experiences with establishing systems and indicators for documenting impacts from infrastructure projects and propose indicators that can be introduced in a Norwegian impact monitoring system
- Identifying issues where information on effects is needed and assessing the evaluability, especially the availability of (baseline) data from projects aided by with Norway.

The State of the Art study shall include the following:

i. An overview of the Norwegian assistance: including;

- An assessment of strengths and weaknesses in the Norwegian assistance which have been identified by a sample of review reports and resource persons.
- A description and assessment of the quality of 10-15 Norwegian reviews of the assistance to the power sector, including a short overview of to what extent output, outcome, impacts and cross-cutting issues have been analyzed and the types of data sources used.

ii. An overview of recent international experiences documented in evaluation and research studies and reports after the World Commission on Dams (WCD) had completed their work, especially studies from the World Bank, Asian Development Bank (ADB) and other aid agencies such as Sweden's Sida. An important issue is the experiences ADB has with the impact assessment system and indicators used after 1999 in other infrastructure sectors, e.g. roads.

iii. An identification of issues where information is needed, and an assessment of the evaluability according to available data.

1.3 Key Dimensions of Power Sector Development and Impacts

Building power plants, transmission- and distribution systems for power constitute necessary but far from sufficient conditions for sustainable development, economic growth, technology transfer and poverty reduction. Such investments must be placed in an institutional and political context that secures reliable and predictable access to power so that industry, agriculture and households become willing to invest in- and learn to use power-using implements and equipment as a basis for increased value added of their economic and social activities.

When assessing the contribution of power sector development on growth, sustainable development and poverty reduction, it is important to distinguish between the impacts of:

- expanding the coverage of transmission and distribution of power to communities where households and businesses (farming and non-farm) have hitherto not had access to grid-based power,

- giving poor people access to electricity, and how this impact is influenced by the property rights regime and access to credit on affordable terms,

- what opportunities are available for use of the power supply (electric light in houses, schools, clinics and work places, water pumps, television, radio, various machines and engines)

- the power supply terms (tariff level and structure and connection fee levels) for different user categories.

Poverty reduction is the overarching development aid objective, and when development cooperation funds are used for power sector development, one must also assess the poverty reduction impacts of such investments and technical assistance for development facilitating sector reforms. In order to do this properly one needs to take explicitly into account that sustained poverty reduction effects and the lasting effectiveness of power sector development activities depends on:

- the income and wealth profile of the area/communities affected by the investment project or the policy reforms,

- the rights and access of the poor to affordable credit to pay for power access as well as power-based technical implements for households and business development,

- putting in place lasting efficient maintenance procedures and routines,

- and will be magnified by simultaneous investments in and effective operation of adequate and reliable all year road access, water supply and telecommunications.

With these conditions in place, power supply to communities previously without power will experience:

- More and extended time with reading and working light available for studies, work, and social activities with the family and the community.

- Increased possibilities for completing school and educational opportunities,

- Increased access to information and knowledge via television and radio,

- Increased opportunities for cold and hygienic storage of food.

- Increased economic returns to labor due to the ability to use productivity enhancing electric implements,

And as a joint result of all of this:

Enhanced income earning opportunities

Furthermore, but an integral part of the above:

- More girls and women will be able to complete their schooling, become more mobile, and thus find an expanded set of off-farm job opportunities,
- Fertility and birthrates will slow down and reduce population pressure on scarce land and water resources,
- Reduces infant and child mortality, which also reduces the pressure on women,
- Improved access to water and irrigation,
- Improved literacy facilitates access to knowledge of the importance to family health and welfare of improved hygiene,

1.4 Why Norway?

The rationale for Norway's development cooperation focus in then electric power sector is a perception that Norway possesses relevant frontier technology and knowledge for the development of hydropower projects and transmission and distribution systems for power, including the establishment of legislation, regulatory functions, sector institution building and administration of the power sector.

Furthermore, Norway is believed to be able to contribute to the establishment of transparent systems for management and operations of the power sector, along with efficient control and monitoring routines and good governance.

Norway has pioneered power sector liberalization and cross-border power sales agreements, and has extensive experience in advising developing countries in the planning, support to local executing- and implementing agencies of power sector projects with regard to consulting services, contracting as well as institution building.

In addition, Norway has a highly developed industry for supply of turbines, transmission networks and the accompanying equipment, software for network operations and monitoring and maintenance.

As a result of the above role of hydropower and power sector institutional development in Norway, and the perception that this expertise and competence can play an important role in facilitating economic and social development abroad, public and private Norwegian power sector knowledge centers have been developed and the Norwegian Governments has made considerable funds available over the development assistance budget and research and education budget such as:

- The Norad Fellowship schemes and the Quota Fellowship Scheme,
- Funds for research cooperation between research institutions in Norway and in developing countries,
- Specific hydropower-related short-term courses organized by the International Centre for Hydropower (ICH) in Trondheim,
- Establishment of water resources management centers in developing countries, e.g. Hydrolab in Nepal,
- Financial support for increased South-south cooperation in a.o. the power sector,

- Foreign aid funds and export credits to finance direct investments and associated training of recipient country staff, and technical assistance for sector reforms and capacity building as described above.

1.5 Study Approach and Method

The approach in this report has been first to establish an international State of the Art as regards analytic methods, indicators, data and results/knowledge as regards development impacts – in particular what is known (and not known) about results/outcomes and long-term impacts -, effectiveness and sustainability of project- and institutional aid to the power sector.

Obviously, such impacts and outcomes will depend crucially on the context of the aid cooperation, i.e. the extent to which projects and support of reform processes have been donor driven and rushed, and the extent to which the projects have succeeded in establishing a genuine local ownership to the implementation and continued operation and maintenance.

Furthermore, the ability to reliably document impacts and the incremental value of a project (whether investment in a power plant or technical assistance to develop and implement a policy reform) depends crucially on the project responsible agencies having selected a set of appropriate development indicators and control areas and monitored the development in these from before project startup until well after completion.

In order to establish this State of the Art knowledge base, some key international knowledge centers were identified and contacted for access to relevant studies and data for use in this report as a basis for establishing feasible good practice assessment methods.

For the international overview, invaluable assistance in the form of access to documents and research (much of it still ongoing) has been provided by a large number of energy-, water-, private sector-, environment- and social development experts in various departments and sections of the World Bank Group (WBG)[2]. The extensive documentation of results and methodologies for impact analysis developed by the joint World Bank/UNDP ESMAP[3] (Energy Sector Management Assistance Programme) has been particularly useful for the rural electrification impact understanding and as regards .what sort of data one will need to do proper with/without analysis of impacts of future power sector projects and reform advisory services in cost-effective ways. In addition and equally important, the Operation Evaluation Department (OED) of the World Bank, the World Bank Energy and Mining Sector Board, the various Regional Departments of the World Bank, and special overview studies commissioned to independent researchers and consultants by various offices and departments in the World Bank have provided a wealth of up-to-date in depth analysis and information.

ADB has provided valuable evaluation experience from power sector- and other infrastructure investment projects and policy reform technical assistance along with methodological

[2] WBG consists of the World Bank, the International Finance Corporation (IFC) and the Multilateral Investment Guarantee Agency (MIGA).

[3] ESMAP is is a special global technical assistance partnership established in 1983 and sponsored by the UNDP, the World Bank and bilateral official donors and managed by the World Bank. It's mission is to promote the role of energy in poverty reduction and economic growth in an environmentally responsible manner.Its work applies to low-income, emerging and transition economies and is focused on access to modern energy for the poorest, the development of sustainable energy markets, and the promotion of environmentally sustainable energy practices. Norway is among the ESMAP sponsors.

material on how plan and prepare for surveys and data collection so as to monitor the selected development indicators and trace stakeholder impacts, e.g. distribution of benefits and costs between poor and non-poor affected parties, and for comparing various impacts on affected stakeholder (with explicit treatment of indigenous populations where appropriate) to those of comparable control groups.

Both the WBG and ADB have provided their directives and guidelines and examples of how these are being used to quality secure projects and test the effectiveness and quality of the their technical assistance to recipient institutions undertaking reforms in their respective infrastructure sectors.

In addition, very important methodology development and analytic work providing insight into synergies and complementarities between different types of physical infrastructure and how infrastructure provision impacts on welfare and quality of life, have been provided by the International Food Research Policy Institute (IFPRI), Resources for Future (RFF), World Resources Institute (WRI), the Inter-American Development Bank (IDB), and the Global Environment Facility (GEF); all of them located in Washington D.C. As far as possible, the experience of and literature from these institutions since the closing of the World Commission on Dams (WCD) has been collected and reviewed as a basis for the baseline against which the Norwegian and Nordic findings are assessed.

Much experience regarding direct and indirect impacts and development effects of large dams has been analyzed in studies commissioned by the WCD which was established in the 1990s following severe criticism from NGOs and affected local stakeholders in the influence areas of some large dam projects financed by international aid agencies and development banks. The most recent and thorough of such studies was completed at the close of the WCD and published in 2005 with detailed case studies of the impacts and handling of these for large dam projects in Brazil, Egypt and India, see Bhatia et al (2005). This large two volume study constitutes a key reference in this State of the Art Review.

The Norwegian and Nordic review documents and project reports assessed in the following have been sampled and collected from Norad files and from those who conducted the reviews. This has been done in close consultation with Norad following an examination of the totality of such assistance as described in Teigland (2006). A sample of evaluation reports, independent reviews and project reports on Norwegian and Nordic projects and institutional cooperation contracts in Norway's development cooperation partner countries were then selected and reviewed in order to establish if they had reached comparable or contradictable conclusions and recommendations, as regards their access to and use of good practice methods[4]. With this background information, this report illustrates both strength and weaknesses of the various approaches adopted in project- and institutional development cooperation by international (including the other Nordic countries) and Norwegian aid agencies, as well as the importance of project- and institutional cooperation agreement designs for the eventual outcomes.

[4] Six African and five Asian developing partner countries were included in this sample, and a total of 36 such reports commissioned by Norwegian and Swedish aid agencies were collected and reviewed for this purpose, including nine reports on Norwegian and Swedish power sector cooperation assistance to Mozambique, seven for Nepal, five for Uganda, three for Tanzania, Bhutan and Palestine, 2 for Namibia, and one for each of South Africa, Zambia and Viet Nam.

Norwegian independent consultants who have been extensively involved both in implementation of Norwegian project- and institutional power sector aid cooperation and reviews/evaluations of it, have provided reports (both project documents and reviews/evaluation reports) and oral feedback on their experience regarding strengths and shortcomings of the Norwegian power sector aid activities over the past two decades.

This information base has constituted a comprehensive basis for setting a baseline against which the Norwegian experience and knowledge base in the same areas can be compared and assessed from the perspective of the objectives outlined above.

2. NORWEGIAN AID AND THE POWER SECTOR

The objective of this State of the Art study is to get a broad picture of Norwegian aid activities in the power sector the last 25-30 years, with priority to activities that will be relevant for aid in the coming years. The main purpose is to identify and assess which key questions the coming evaluation should focus on and their evaluability. Since this is Norwegian funding of major projects in a large number of developing countries where at the same time other bi- and multilateral donor agencies and finance institutions participate in the same and/or similar projects, such evaluation needs to compare Norwegian- and international appraisal-, assessment- and evaluation methodologies and practice.

2.1 Overview of the Norwegian Assistance 1980 - 2005[5]

During the past 25 years Norway has granted more than NOK 10 billion on power sector aid. However, relatively little is known regarding the effects and impacts of this aid.

The annual volume of power sector aid peaked in the early 1990s when NOK 6-700 million were disbursed each year (at constant inflation adjusted prices). Since the beginning of the new Millennium, the annual disbursement has been around NOK 400 million[6].

NOK 6.4 billion or 63% of the overall power sector grants during this period has been allocated to African countries, whereas 21% was given to Asian countries. 70 countries in all and five regional organizations have received such aid. The largest regional support activity has been for SADC which has received NOK 400 million, or almost 4% of the total.

By far most of the power sector aid has been bilateral. Most of it has been concentrated in Mozambique and Tanzania, with NOK 2- and 1.7 billion respectively (almost 20% and 17%) of the total. The eleven countries that have received most such aid have received 70% (more than NOK 7 billion) of the total. During the same period 15 countries received less than NOK 1 million each. Only 4% has been distributed via multilateral channels.

Planning and construction of transmission and distribution of power received 59% of the total allocation during the 1999-2004 period, while 17% were used to assist with energy policies and administrative planning. Power plant construction only received 13%. Very little has been classified as training and education and allocations for solar and wind power (alternative energy sources) have been minimal.

Regional and national economic development in general and industry development in particular have been important reasons for such aid, whereas environment has been reported as a main or at least a key reason in relation to almost 10% of the allocation during the last six years, provided the classifications undertaken have been correct.[7]

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[5] This section is based on assistance provided by Jon Teigland, Norad and his colleagues. See J. Teigland (2006) "Norsk kraftrelatert bistand 1980-2004" Unpublished Memo, Norad Evaluation Department

[6] A MFA expert group proposed after the change of Government in the autumn of 2005 that this amount should be doubled.

[7] A recent review (2005) based on OECD/DAC criteria for environmental classification of aid projects of a sample of Norwegian aid projects conducted by a group of environmental NGOs, indicated that there has been a substantial misclassification conducted by Norad/MFA/Embassy staff in recent years. Far too many projects were classified as having environment as a primary or secondary objective when in fact they should not have

A large number of different actor categories have participated in Norwegian power sector aid. On the supply side of Norwegian authorities 16 different embassies have been actively involved along with MFA/Norad from where four departments, three divisions, two thematic groups and seven sections have participated only since 1999. During this period, 593 power sector disbursements have been related to 151 different agreement partners on the recipient side, and 162 different executing agencies. The Norwegian partner have had agreements directly for 155 of the 1999-2004 allocations, of which NOK 250 million (67%) have been paid to Norwegian consultants. Norwegian power producers and suppliers of power-related equipment and machinery have had direct agreements for ca NOK 40 million.

Most of the allocated funds have been for national authorities or power sector directorates in the recipient countries. 14% of the total 1999-2004 allocation has been linked to agreement partners in the form of national/regional power supply companies in the recipient countries.

The selection of Norwegian reviews and documents has been done in cooperation with Norad's resource persons. The objective is to get a broad picture and sample of the total population of Norwegian aid activities in this sector the last 25-30 years, with priority to activities that will be relevant for aid in the coming years. Norad's statistical database has been used in the selection process to present an overview of this type of aid (for a detailed overview see the overview prepared by J. Teigland (2006).

2.2 Norwegian Development Cooperation and the Power Sector

Chapter 2, "Goals, principles and conditions for Norwegian development cooperation" p.24 in the Statement to the Parliament on Development Cooperation Policy 2002, begins as follows:

"The overarching goal of Norwegian development cooperation is to contribute to lasting improvements in economic, social and political conditions for the populations of developing countries, with special emphasis on ensuring that assistance benefits the poorest people. This means that poverty reduction is the primary objective of all Norwegian development cooperation".

Eight years before that (in 1994) Norad had established a set of main principles for energy sector activities. It stated that a key condition for achieving sustainable development is access to energy at affordable prices based on sustainable natural resources management. It also postulated that there is a close correlation between economic growth and energy consumption, and that in most developing countries, the energy sector is a high priority area for development cooperation. Against this interpretation of development cooperation recipient priorities and demands, a strategy involving the entire Norwegian energy sector resource base was formulated, which based energy sector aid on the condition that Norway can supply appropriate and relevant competence and that Norwegian suppliers of such competence have the capacity available to take on such aid funded energy sector activities. It was later concluded (1994) that Norway has available human resources for such tasks in the fields of hydropower development, power transmission and distribution, and in the petroleum sector, and that Norwegian energy sector aid therefore would be concentrated in these areas.

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been classified that way. NCG was commisisoned in late 2005 to double check on these findings, and concluded recently in a 2006 report to Norad completely in line with the findings of the environmental NGOs.

New- and alternative renewable energy resources (including bio-energy) were explicitly listed as of marginal priority for Norwegian aid funded efforts in part due to limited Norwegian expertise and capacity in these fields.

These opening paragraphs of *the energy sector strategy clearly implies that the assistance will be sought allocated in such ways that it will be tied to Norwegian supplies of goods and services.* Two issues which have been increasingly hightened on the international development cooperation agenda since the 1990s, were not made key direct goals of power sector cooperation.

- *Tied aid*, which Norway has strived to abolish among donor countries, was retained as practice for significant parts of Norwegian power and energy sector aid cooperation.

- *Poverty reduction* – while an overarching goal for Norwegian development cooperation in general – was placed in the "back seat" justified by the assumption that such impacts are of a long-term nature and will result in the form of "trickle down effects" from the contribution to overall modernization facilitated by means of infrastructure investments in power plants, transmission- and distribution systems, and the complementary technical assistance for institution building and training of staff provided at national and regional levels to enhance the effectiveness, efficiency and governance of the energy sector. Such institution building and associated training was provided in response to the international reform trends in the energy sector which included the establishment of independent sector regulators, new energy legislation and the provision for private sector participation in energy supply activities.

Norwegian power sector funded activities during the last 10-15 years must be assessed against such a background. Norwegian power sector assistance is first and foremost designed to facilitate the longer term transition to a modern power-based economy and as part of the process helps develop legislation, regulator systems and institutions based on the "best practices" and experience from modern and developed economies. Capacity building and training is provided based in the same line of thinking. While several Norwegian funded rural electrification projects have been implemented, this has not been the focus of Norwegian energy sector aid, since it was recognized from the start that dispersed populations, extremely low incomes and extremely high costs of connecting the rural poor to a grid would jointly make massive rural electrification programs non-sustainable at that stage in the development process of the main cooperating countries of Norway.

The Norwegian power sector aid strategy thus had a long-term perspective very much based in the belief that sustained economic growth and poverty reduction would result from the "trickle down" effects of such national grid or trunk system investments supported by assistance to establish proper sector legislation and to create local capacity to develop and maintain regulatory regimes.

Much of the investments funding was provided as parallel-financing with the multilateral development banks on project components where Norway had been identified as having a competitive edge. In line with the already internationally developed guidelines and directives in use by multilateral aid agencies, the strategy required Norad to apply similar environmental standards as a condition for financing of development plan preparations and subsequent use of the natural resource bases affected by power sector developments. Similar requirements were applied to projects financed by means of mixed credits. The Norad (and other likeminded

donors) requirements for sustainable resources management implied a need for energy sector legislation and regulatory authorities capable of securing such management of the country's natural resource base. Since most of the least developed countries that were the target of such aid had poorly developed institutions, legislation and regulatory authorities, lack of transparency, and governance regimes unable to prevent corrupt practices and misuse of aid money, it was decided that long-term aid for institution building at a policy level and management/administrative level was needed along with technical sector expertise.

The strategy further required the local agencies/institutions responsible for power production and distribution apply sound economic principles and thus makes it transparent what are the real capital- and operating costs, and equally important, how subsidies (e.g. cross-subsidies) are designed and monitored so that their impacts can be traced.

At the turn of the Millennium, infrastructure investments – including in energy – had lost much of its momentum as development drivers in foreign aid portfolios, including that of Norway. Beginning around 2003, properly functioning infrastructure was again recognized as a necessary (but not sufficient) condition for development and reduction of poverty, and for achievement of the Millennium Development Goals (MDGs) by the international development cooperation community.

2.3 Comparing Norway's and Sweden's Power Sector Strategies

It is of interest to compare the Norwegian energy sector strategy of the 1990s based on use of donor country expertise and equipment with at best indirect reference to poverty reduction, to the Swedish policy for sustainable energy services presented in December 2005. The Sida paper on *"Policy sustainable energy services for poverty reduction"* presents a power sector policy to be valid until 2010. It is based on the same principles as the Norwegian aid policy quoted from at the beginning of this section, namely the MDGs and poverty reduction. The Sida policy explicitly states that *" the overall objective of Sida's support to energy sector development is to assist in the development of sustainable energy systems that enable poor people to improve their lives.*"

Sida's support to the energy sector rests on two pillars:

- Reform of energy institutions and development of sustainable energy systems. Sida provides grants for technical assistance and capacity development and supports investments in energy systems through grants, credits and guarantees,
- Sida strives to align processes with partner countries and to provide energy support in well-coordinated consortia with other donors.

With infrastructure and energy back "on stage", MFA in early 2005 established a Task Force (MFA 2005) with secretariat located in Norad to propose a new strategy and action plan for promoting Norwegian activities in the power sector in developing countries. The mandate of the Task Force in line with Stortingsmelding No. 35 (2003-04) on development cooperation. was to achieve *"increased Norwegian efforts and activities in developing countries in fields where Norway has unique competence and capabilities that are in demand locally"*. The Task Force Report was submitted in December 2005.

The Task Force takes as a premise for its work that the main principle of Norwegian development cooperation is to secure national recipient ownership to the development

process. In line with this, it is decided that the developing country authorities themselves decide on development priorities, including in the energy sector. It is the recipient governments that must take responsibility for poverty reduction initiatives, budget allocations and programme implementation. The Task Force concludes that access to renewable energy is an important and necessary ingredient in a broader strategy for poverty reduction as well as an important component in the global strategy for preventing or slowing down man-made climate change. Compared to the 1994 strategy, the report explicitly states that electricity from photovoltaic cells in many cases in e.g. rural Africa could be the most cost-effective alternative for households without access to the national or a local grid. In this context one should take note of the fact that no more than 0.1% of Norwegian power sector aid (NOK 1.5 million, inflation adjusted to 2004 prices) was the total allocation for OECD-DAC[8] sub-sectors 67 "Solar energy" and 68 "Wind power" during the 1999-2004 period, suggesting that such rural electrification options have received minimal attention in the Norwegian power sector aid context so far, see J. Teigland (2006).

However, even if poverty reduction is now included as an explicit report element, the main focus of this Task Force report remains much as in the 1994 strategy, namely with a focus on the following topics, each of which are treated in separate working papers:

- Power sector investment needs
- Barriers to investment in the power sector
- An overview of Norwegian expertise and services in the Power sector
- Restructuring of the Power sector – historical trends, current status and prospects
- Environmental and social issues relevant for power development
- International Forums and Partnership in the Power sector
- Instruments and Facilities for engaging Norwegian Companies in the development of the power sector

The Task Force makes a brief reference to the Paris Declaration where the focus is on recipient orientation, harmonization and adaptation, good governance and anti-corruption measures, and both human rights and poverty reduction are listed as important guiding principles for the Task Force.

The Task Force identified six key challenges related to power sector development cooperation in developing countries:

- **Poverty reduction** requires the development of energy systems that can bring electricity to poor users. Distribution is a major challenge, and in the short run affordability limits the focus to mostly stand-alone solutions. Sub Sahara Africa has extremely low degrees of rural electrification (1-5% in most places).
- **Access to power sector investment capital** is poor due to a series of mutually reinforcing political-, governance- and financial risk-based barriers to invest. Lack of matching funds add to the problem.
- **Development of adequate public institutions** that can take on the sector development challenges.
- **Development of reliable and stable exogenous framework conditions** for private investors.

[8] OECD-DAC = Organization of Economic Cooperation and Development – Development Advisory committee

- **Effective operation of power plants and distribution networks** based on transparency about real costs of investments as well as operations and maintenance.
- **Mainstreaming of environmental and social challenges** in the planning and implementation process.

Identification of activities to facilitate and help promote Norwegian power sector expertise and services remain core elements also in the 2005 Strategy, but the degree to which Norwegian power sector aid will be used in ways that provide preferential treatment of Norwegian suppliers is less clear than it was in the 1994 strategy. Compared to the 2005 Sida strategy for Swedish power sector aid, which puts poverty reduction in the "drivers seat", the new draft Norwegian power sector strategy of 2005 is far more supplier focused, even if it is more supply-demand balanced than the 1994 strategy. The poor are now included in the subtitle of the report, and one of the seven working papers is dedicated to principles for addressing environment and social issues. Another important focus in the proposed new strategy is that Norway should focus it's power sector aid on transparent tender- and acquisition process (presumably including both tenders for investments, consultancies and institution cooperation agreements) as well as transparency with regard to resources access. Good governance is now seen as a fundamental condition for development effectiveness and efficiency, and in at least three of the main developing cooperating countries for Norwegian power sector aid (Tanzania, Uganda and Nepal), the energy policy and strategy is now explicitly anchored in their (donor-driven) PRSPs.

However, the contrast to the 2005 Sida strategy which is titled "*"Policy sustainable energy services for poverty reduction"* is clear from the title of the Norwegian Working Group report which is titled (in English translation) "Proposal for *strategy and actions for the promotion of the Norwegian assistance in the power sector in developing countries*[9]*"*. The underlining is made to emphasize the difference in focus between these two 2005 Nordic power sector aid strategies.

[9] The Norwegian title is "Forslag til strategi og tiltak for å fremme norsk innsats i kraftsektoren i utviklingslandf". Innstilling av arbeidsgruppe nedsatt av Utenriksdepartementet. Oktober 2005"

3. INFRASTRUCTURE AND DEVELOPMENT

3.1 Macro-economic- and Development Impacts of Infrastructure

Before addressing the focal issue challenges specifically linked to power sector impacts, it is useful to have a brief overview of what is known and not known as regards the macro-economic and development impacts of infrastructure more generally.

Such empirical research is rather recent (most of it during the last two decades), and the first such studies caused substantial academic debate for methodological reasons. J. M. Antle (1983) used aggregate agricultural production data for 1965 from 47 developing and 19 developed countries and included infrastructure to explain differences in agricultural productivity across countries. Not surprisingly, he found that infrastructure (in that study defined in GDP terms per unit of land) had a strong positive impact on agricultural productivity in all categories of countries. Antle followed this up with a similar study on India (J. M. Antle 1984) and came to the same conclusion. These econometric method adopted for studies, however, suffered from severe shortcomings in design, and therefore really did not answer the fundamental impact question. For one, the data used were such that one might equally likely have estimated the impact of output on public infrastructure capital. Secondly, the analysis could not exclude the possibility that due to common trends in infrastructure and output, it may have reflected a spurious correlation between output and capital stock that is driven by a common time trend and not by any underlying relationship between the two variables.

Later development economic studies, however, have done much methodologically and empirically to improve our understanding of such impacts and their direction of cause and effect.

In their analysis of indirect economic impacts of large dams for the World Commission on Dams, R. Bhatia et al (2005) four real world large dam projects are examined. Two if these are located in **India**, one in **Egypt** and one in **Brazil**. Availability (or lack thereof) resulted in the analysts applying different analytic techniques in assessing the indirect effects and where possible –the distributional effects – of the four projects.

In order to provide some insight into the long-term effects of such dam projects, the authors estimate inter-industry linkages and income-induce impact by means of the value-added or multiplier effects[10] of such project. The results are not strictly comparable across the four projects because the analytic models used for the estimation of impacts are not identical between the projects, but the results can nevertheless be summarized as follows (r. Bhatia et al (2005), p.92-93) to provide an indication of orders of magnitude of such indirect effects:

- In the case of the Sobradinho Dam (and the cascading reservoirs) in Brazil, the value of the multiplier range between 2.28 and 2.40 under the assumption of unconstrained labour supply and capital. However, under a (perhaps more realistic) supply-

[10] Multiplier effect means the overall economic effect (direct and indirect) in a new equilibrium situation after the affected economy has been allowed to adjust to the total impacts of the investment or policy reform. A multiplier of e.g. 2 then means that that the overall effects of the action are twice as large as the immediate observable direct effects of it.

constrained scenario for selected sectors, the multiplier drops to 2.00. This (i.e. a multiplier of 2.00) implies that for every unit of value-added generated by the sectors directly affected by the dams, another unit could be generated downstream or indirectly in the region.

- For the Bhaka Dam in India, the estimated multipliers are somewhat lower; in the range of 1.78 and 1.90 depending on the assumptions about (i) the seepage of water from canals can have on the availability of groundwater for irrigation, and (ii) the availability of additional thermal power in the absence of the Bhakra Dam.

- For the Bugna village check dams in India the value-added multiplier is still lower and estimated as 1.41, meaning that for every Rupee of additional value added directly by the project in the agricultural sector, another 0.41 Rupee is generated in the form of downstream or indirect effects within the Bunga village and neighbouring areas of project influence.

- In the case of the Aswan High Dam in Egypt, a value-added multiplier range from 1.22 when employment of labour supply and capital is exogenously specified, to 1.40 in an fully unconstrained (unlimited supplies of labour and capital available at the fixed wage rate) scenario.

Economic growth is endogenous. This means that growth levels are driven by the composition of public expenditures – including the infrastructure investments – but at the same time, public expenditures – including infrastructure investments are driven by economic growth. In a recent study, Lumbila (2005) has shown that countries with more developed infrastructure see a disproportionately greater impact of infrastructure on foreign direct investments (FDI) and domestic investments and on growth. At the same time, countries with lower, underdeveloped infrastructure see no statistically significant impact of infrastructure of investment on growth. In other words, not only can a lack of infrastructure be an impediment to more investment, but it can also be one of the dimensions of the so-called poverty trap whereby a critical mass of infrastructure is needed to convince investors to make the decisions leading to sustained growth. This suggests that there are critical and interlinked infrastructure threshold levels that have to be reached before one can trace a growth and poverty reduction impact of infrastructure investments. Most African countries have yet to reach such infrastructure threshold levels, and understanding this helps to explain why it has been difficult to detect any significant correlation between infrastructure provision and growth in Africa. Adding to this threshold level are institutional capacity constraints and infrastructure market distortions observed in African countries.

In sum, most papers that have attempted to seriously model the role of infrastructure in economic growth have found strong indications of its importance. This is also the case for Sub-Saharan Africa. A comprehensive review based on national macro-data for the 1960-1997 period clearly shows more infrastructure stocks are associated with higher growth rates and that there are only exceptional cases where this correlation is not observed (Estache (2005), p. 9). **The clear message from this research is that there will be no growth and no significant poverty reduction in Africa without a major improvement in the level and state of infrastructure.** This observation has led to counterfactual growth impact studies of what is the macro-economic cost of not investing in infrastructure? Esfahani and Ramirez (2003) thus estimated that had Africa had East Asia's growth rate in telephones per capita (10% versus 5%) and in electricity generation (6% versus 2%) , Africa's per capita growth

rate would have been almost 1% higher. Others have done a similar country by country counterfactual comparison for 21 African countries with South Korea as comparator, and the study shows that on the average the growth per capita would have been slightly above 1% higher than observed, see Calderon and Serven (2004).

These findings are in line with the diverse body of international empirical evidence showing that public infrastructure has a significant positive impact on output and on the outcome variables studied. However, the number of such studies on developing economies is rather limited, especially for Africa, partly because of lack of data on infrastructure stocks and outcome variables.

Recent studies of the "engines of growth" also show convincingly that during the 1970-1990 period, over 50% of the variation in growth per capita in Africa is explained by institutional variables, see Naude and Krugell (2003). Perhaps the most important finding from such research is that any support to infrastructure in Africa will require not only commitment to finance constructions, but such commitment is also critically needed to help establish and sustain the necessary institutional changes that provide for the physical infrastructure to deliver infrastructure services in cost-efficient ways. In this context, it is important to take into account the fact that while the time it takes to complete the physical construction may seem long, it is often short compared to the time needed to undo wrong institutional arrangements and associated incentives while trying to rebuild those needed to ensure the long-term viability of the investment.

This interlinked infrastructure/institution reform challenge has been underestimated in the past, in particular as regards Africa. No wonder therefore, that the estimated impacts of growth via infrastructure investments on poverty reduction have been less in Africa than in other regions. It has been estimated that increasing infrastructure investments by 3-4 percentage points of GDP, increases poverty reduction effects by 0.6 – 1% annually, Besley and Burgess (2003).

3.2. Are Trickle Down-based Strategies Effective after all?

ADB has recently completed a special evaluation study on cost-effective pathways out of rural poverty in P. R. China[11]. Based on field work and extensive interviews in poor areas with distinctly different socio-cultural and natural resources characteristics in Sichuan and Yunnan provinces, this study found unsurprisingly that the real impact of infrastructure investment on poverty reduction varies across regions depending on local conditions in the particular area.

In areas with limited natural resources for agricultural expansion, and where the population carrying capacity of soils and water is virtually exhausted, people escape from poverty through the migration of younger family members to the cities or other provinces with better job opportunities. In such areas, e.g. in part of rural Sichuan Province, the lack of good local infrastructure such as rural roads in, and expressways through such poor regions does not stop people from migrating out of their villages, as long as they can find better job opportunities in the outside world where they have social connections. It is the ability to migrate that

[11] Special Evaluation Study (May 2006), "Pathways out of rural poverty and the effectiveness of poverty targeting. OED, ADB.

determines the extent to which they are able to escape poverty and contribute with remittances back to their origin.

This ability to migrate is due to (i) the many jobs created by the sustained rapid economic growth in China, (ii) the emergence an integrated labour market nationwide, and (iii) easy access to information about job opportunities arising from already having relatives and friends outside the village and province who have migrated earlier.

The *direct relationship* thus emerging between investment in for example an expressway through such a province and/or local roads serving such poor areas, and observations of poor households arising from poverty is rather weak. However, one should clearly acknowledge that *expressways have had a strong indirect impact* on poverty reduction because of the critical role the investments in establishing the National Trunk Highway System has had in removing bottlenecks to the sustained high rate of sustained economic growth in China. This is the underlying factor that created the new jobs in the coastal and central areas and thus made such large scale migration possible. From this macro-economic perspective, investing in expressways as a means to create a climate for workplace investments that facilitates migration from poor growth-constrained communities could be a highly cost-effective poverty reduction project, even if it contains no explicit geographically placed poverty reduction component.

Analogous to this indirect trickle down development effect of building expressways or national trunk highways is the effect of national trunk transmission of power to those areas where the scope for creating new competitive economic activities is present provided adequate and reliable power supply is provided. China has identified adequate power supply as a critical national and regional growth factor in line with- and mutually reinforcing the role of the national trunk highway system, and seen from this perspective one may argue that power plants and transmission systems represent key engines of economic growth, job creation and opportunities for sustained poverty reduction.

However, in areas where the natural resource conditions, population densities and agro-cultural practices combine to suggest a considerable underutilized carrying capacity of the land, the poverty reduction impacts from improved rural roads to supply all-year reliable and smooth transport can be significant, and further enhanced if reliable power supply and telecommunications are provided at the same time. In e.g. rural areas of Yunnan Province with high potential for developing commercial crops, poor households have risen from poverty by growing such crops, after good road access was provided so that commercial firms signed contracts with farmers and purchased their production. At the same time improved power supply and telecommunication has provided for better access to market information and scope for local value added to the crops and agricultural produce.

In these areas, good infrastructure were critical to attracting commercial firms to engage in contract farming, because such firms have a choice between locations, and communities without good road access and infrastructure end up as losers because the time losses, higher transport costs and uncertain access could impose severe losses on the commercial companies.

This Chinese experience is not automatically transferable to a no-growth African setting. However, it points to an important finding which is that direct allocation of aid funds to poor stakeholders may not always be the most cost-effective way of helping the out of poverty on a

sustained basis. In places where the lack of power supply is identified as a key impediment to growth, the Norwegian power sector aid strategy as described above should not be scrapped.

3.3 Complementarity with other Investments and Policy Actions

3.3.1 The international experience

The absorptive capacity for infrastructure aid is enhanced or limited by (i) macro-economic conditions, (ii) institutional constraints, and (iii) availability and the effective functioning of other complementary infrastructure. For example, the sequencing of resource allocation across sectors or within sectors matter. This applies in particular when there are infrastructure bottlenecks. For example, education expenditures will have a higher social rate of return if schools have electricity and schoolchildren have light for doing homework after dark, and if road transport provides for faster transport to and from school and for good teachers to be attracted to take a job in an otherwise remote location. Likewise, improving access to electricity from large utilities will not help if transmission capacity is insufficient.

G. Foley (1999) points to the important finding worldwide that it is often the provision of all year vehicular road access to markets, telecommunications, clinics and schools that leads to a substantial growth and diversification in economic activity and rising local prosperity, which in turn leads to local increased demand for higher quality lighting, and for time-saving- and productivity enhancing appliances that are cheaper to use based on a mains electricity supply. It is at this stage of rural development that power supply and demand meets and can justify rural electrification programs according to the analysis of this review report. At this stage in the rural development process, *"rural electrification is perhaps best seen as a necessary, but not sufficient, condition for economic development beyond a certain level; an electricity supply, at an affordable cost, is – in other words – one of the important prerequisites for economic and social development."* , see p.34 in G. Foley (1999), op.cit.

J. Saghir (2005), p.5 similarly concludes that "*merely introducing cheap, easily available modern energy is not enough to ensure socioeconomic progress. Other factors are also crucial.... when development efforts fail because of poor crop pricing and marketing policies, improving electricity supplies alone will have little effect on local welfare."*

With regard to documenting complementarities between different types of public infrastructure, one of the first to address this explicitly was a USAID study of the effects of rural electrification in 1983. It concluded that the improvements that electrification brings are amplified when complementary infrastructure investments accompany it.

A World Bank study in Peru in 1999 used data for the 1994-1997 period to study the poverty and social development effects of policy interventions in Peru. It found that providing a combination of infrastructure services, such as electricity, water, sanitation, and telephones, has a greater impact on poverty reduction than providing a single service. More specifically, the Peru study established that the provision of a second complementary service is important, but much more significant is the provision of a third or fourth service. In fact, adding the fourth service could bring welfare improvements that are seven times greater thn those delivered by the second service.

Recently, S. Chowdhury and M. Torero (2005) at IFPRI have provided pioneering empirical evidence from their Bangladesh research. It shows beyond doubt that access to more than one form of infrastructure has a positive effect on per capita expenditure and poverty. In fact, the

welfare effects of access to multiple forms of infrastructure are greater than the sum of effects for each type of infrastructure individually. The following empirical findings from their Bangladesh study illustrate this:

- There are strong complementarities between close proximity of households to roads and telephone access, which is consistent with a reduction in transaction costs and easy access to markets. Similar positive complementarities were identified with electricity.

- Access to a telephone was shown to increase per capita monthly expenditure of poor households to 12 Taka. However, if the poor household has access to both telephone and better roads, its expenditure increases to 89 Taka. If in addition, the household has access to electricity, it increases to 185 Taka.

- Among the three infrastructure types, electricity appears to have the highest individual impact in this particular Bangladesh study. Returns are higher, however, when access to household electricity is combined with access to paved roads and public phones.

- The sole effect of roads and phones is modest, but their impact increases considerably when combined with other forms of infrastructure, i.e. electricity.

3.3.2 The Nordic experience

Rural electrification implemented by Electricidade de Mozambique (EDM) in the area of Ribaue/Iapala in the Nampula Province in Northern **Mozambique** the 1990s was funded by Sweden, see Section 4.4 below for details. The socio-economic and gender study carried out in 1997 (Åkesson (1997)) concluded wholly in line with the rather conditional development impact studies on the importance of the complementarity between different types of infrastructure and availability of and access to various services, cited in Section 3.3.1 above.

- The lack of mechanical and electrical repair facilities in the district is an important obstacle for development of different local economic activities. Such facilities could have been in place based on diesel generated power, but grid electricity would have cheaper and more attractive and a development booster.
- The many artisans in the districts are limited in their activities due to economic constraints that only to a limited degree can be removed when grid electricity is provided
- More investments in complementary infrastructure areas is required if social and economic activities shall be able to make use of the future supply of electricity in an efficient way.

The NOK 820 million Pangani Falls Redevelopment Project (PFRP) in Hale, **Tanzania**. Power production which started in 1994-5, provides an interesting dimension of complementarity between actions that jointly enhance development. The PFRP implemented a major HIV/AIDS programme successfully, see discussion in Section 4.4 below. The recent PFRP Evaluation (Orgut & WSP (2005)) found in their attempt at identifying development effects, that an important side effect of the provision of a significant increase in stable and reliable power onto the national grid has helped increase and stabilize power supply for industry. In this way, the project helped create more direct and indirect employment (multiplier effect) for both men and women. This in turn has kept the men busy working as opposed to being idle drifters engaging in sexual matters) and provided many women with

non-prostitution economic opportunities. By reducing un-and underemployment and providing for job stability in the community trafficking has been reduced, and by actively pursuing HIV/AIDS information campaigns as part of the PFRP project implementation, the reduction in HIV/AIDS incidence has been enhanced.

3.4 The Energy Project Cycle is very Looooong

Electrification assistance must be seen in a long-term perspective because successful electrification is a process of solving problems over long periods of time where the nature of the problem actually change as the program evolve and mature. It takes decades to implement. At the same time, it must be recognized that such projects are highly country-specific and have both short- and long term effects.

As emphasized above, one often has to take into account important impact inter-linkages in the form of complementarities between physical investment projects and institutional reforms. For one, with new or revised legislation and regulations putting increasing attention to and concerns for affected environments and stakeholder groups, the political preparation for project and reform acceptance and local ownership to take hold could take a long time (e.g. the process from when China's Three Gorges Dam project was first launched as an idea, until final design was approved and the construction and associated resettlement started). The various appraisals and impact assessments increasingly require time-consuming field work and simulation of alternatives as inputs to the political decision-making process. Putting together the financing package for such projects can also be a time-consuming process, especially in places where there are considerable risk elements to be accounted for.

And while these non-construction activities take place, expectations will have emerged among directly affected stakeholders and outside potential investors in e.g. real estate and various types of businesses that could become attractive options as a result of the investment.

Then follows the construction period, which in the case of power projects tends to take several years and require temporary labour and expertise from outside the affected area. These people will require various goods and services not originally supplied in the affected construction area, and this again attracts new service businesses.

After project completion much of this expertise and labour will disappear, but some will remain to operate and maintain the facilities. In addition, new jobs may be created as a result of the establishment of the project both in the immediate vicinity of the project site, but also far away as a result of the new opportunities created.

Infrastructure projects therefore have to be appraised and evaluated over an extended time frame, e.g. 25 – 40 years, to capture both the short term peak effects and the long-term and more stable lasting effects on economic activity as well as on the social fabric and the environment. Unfortunately, it rarely happens that an aid recipient country will accept to spend resources (even grants have opportunity costs) on post-completion monitoring and evaluation of long-term effects, and donors have not done much to insist on providing for establishing such understanding when contracts for donor funded infrastructure projects have been signed. As a result, we still have only rather limited empirical knowledge of project- and policy reform impacts beyond the completion date. Most of what we know comes from more academic cross country and time series studies, many of which have been funded by donors and international financing institutions as special studies.

4. ELECTRIFICATION EFFECTS ON PEOPLE'S LIFE.

4.1 Focal Issues in Relation to Electrification and Development

Africa is the primary region for aid cooperation due to its extreme poverty incidence and lasting difficulties in reducing it. In order to address how infrastructure provision can help in this context one needs information on availability of, access to, quality and reliability of, and affordability of infrastructure services for different stakeholder groups (e.g. poor, non-poor, rural, peri-urban, urban, households, enterprises). Systematic data collection for the purpose of improving the knowledge base for designing cost-effective policy regimes and projects to this effect has so far not been a prioritized aid cooperation area of the recipient governments and the bilateral donors have not pushed the issue.

Systematic efforts at gradually providing comparable such data over time and between countries includes the Demographic and Health Surveys (DHS) and the Living Standard Measurement Surveys (LSMS). These have gradually developed the questions so as to provide relevant data on access rates for different income categories, but as will be discussed later on, there is still room for low-cost improvement in the questions asked and data collected to provide more targeted and comparable information for diagnosing what measures need to be adopted and which policy instruments are most effective from a poverty reduction perspective.

Full compatibility between the different surveys has yet to be achieved, but that is no excuse for inaction at the investment and policy reform level. The DHS data on 26 African countries at the turn of the Millennium showed (Diallo and Woodon (2004)) that the access rate to electricity for the lowest income quintile was 0%. For the next lowest it was 4%, and for the third it was 12%. Clearly, rural- and peri-urban households dominate these income categories. For the fourth income quintile access to electricity network was 28% and for the highest (fifth) quintile it was unsurprisingly a high 71%. In all the least developed African countries the large majority of the population is thus excluded from networked electricity provision (as well as piped safe water) and the advantages this provides in terms of facilitating household-, work- and study productivity and as a consequence, improved livelihoods. The surveys available shows that these African electricity access rates are the poorest performers with significant deterioration in electrification rates compared both to non-African countries and to other African countries over time.

In 1999 Norad commissioned an overview report of rural energy in developing countries to provide a comprehensive input to power sector policy-making process on rural energy in developing countries, see G. Foley, (1999). This comprehensive overview is of direct relevance to and can in many ways serve as a baseline when examining other and more recent international studies and reports addressing the various issues listed in the TOR for this State of the Art review and the subsequent full evaluation. Based on these combined findings and conclusions on the various policy and project issues derived from the various international references collected and reviewed in the following, this State of the Art report assesses the sample of Norwegian supported projects and programmes in order to identify the key issues that the full evaluation shall focus on.

G. Foley, (1999) starts out discussing focal issues. The basic principle is putting affected people, identified recipient needs, and local ability to take on ownership to sustainable

solutions, before selecting technology. This is also very much the approach now promoted by UNDP and the World Bank, see ESMAP (2003). When assessing the benefits of electrification (as for physical infrastructure in general) the starting point is that electricity is an input to the production of outputs that contribute directly to household well-being, i.e. electricity is desired not for its own sake, but for its ability, along with appliances and implements, to produce goods and services that are more directly desired.

The G. Foley (1999) review thus begins by defining success criteria for rural energy projects and discusses how to meet ideal conditions of seven key dimensions to be considered in view of the guidelines, standards and directives used by international aid funding agencies for power sector projects. These seven success criteria – each being discussed from the perspective of challenges to be confronted and addressed when identifying, approving, designing and implementing a rural energy project – are taken to be as follows:

a. Economic justifiability (that overall identified benefits exceed costs),
b. Financial viability (that user fees and transfers can service the expenditures).
c. Institutional sustainability (that local ownership, capacity and capability is in place)
d. Locally replicable (that the technical and institutional design is transferable),
e. Explicitly addressing relevant gender issues (how women are affected and involved),
f. Environment impact assessment (are mitigation measures identified and put in place)
g. Poverty alleviation and reduction impacts (distribution of costs and benefits)

The discussion in the review of each of these success criteria relates to what is known regarding rural energy provision in the overall development context (items a – d above) and in relation to the core values of Norwegian development assistance with their focus on gender, environment and poverty alleviation (items e –g above). Much of this itemized review focuses on cautioning the reader about relevant issues that have often been ignored in the past.

Just so that there is no misunderstanding; it is not the power plants and transmission and distribution lines as such that reduce poverty. Direct poverty reduction from power projects accrue once the poor are provided access to reliable power on affordable terms. However, some indirect poverty reduction may accrue as a result of power being supplied to community centres for improved public services and as a basis for creating new jobs. When assessing power sector development as a means to reduce poverty one has to distinguish between the impacts of:

- distribution network expansion,
- providing connections to poor households (roles of tenure and access to credit),
- what the electricity can be used for (work-related, household-related),
- the delivery terms (tariff level and –structure).

Experience worldwide reviewed in the following chapters suggests that the poverty reduction impacts of power supply expansion depend on:

- the income profile among affected stakeholders,
- simultaneous investments and upgrading of complementary infrastructures, which mutually enhances each others' performance and returns,
- well functioning institutions and regulatory authorities,
- access to credit among the poor,
- sustained adequate maintenance practices.

Impacts of access to power for the poor materializes in the form of:

- freed up time now available for work, education and family life,
- extended daytime for indoor productive and leisure activities,
- reduced likelihood of drop out from schools,; more girls complete education
- increased literacy, especially among females,
- increased access to information and knowledge from TV and radio,
- possibility for refrigeration and freezing of foods,
- enhanced labour productivity and broadened job and income opportunities,
- enhanced information on importance of hygiene,
- fertility, birth rates, and infant mortality is reduced,
- improved access to potable water,
- reduced pressure on natural resources and the labour market

4.2 Measuring Effects on Affected People

R. Ahmed and M. Hossain (1990) measured the aggregate effects of village level infrastructure (measured as a composite index) on a number of welfare and level of development indicators in Bangladesh and found that infrastructure development increased agricultural production with as much as 32% and household incomes by 33%. In addition, they found such investments to be pro-poor since the landless and smallholder farmers garnered a larger share of incomes from better infrastructure provision.

H. Binswanger et al (1993) did a similar impact analysis in India but disaggregated for each type of infrastructure and found that the availability of electricity tended to increase farmers' investments in irrigation pumps, investments in roads increased bank expansion in rural areas, and all public infrastructure increased fertilizer demand.

Starting in 1999, S. Fan, et.al. started a series of IFPRI studies covering a.o. India (S. Fan et al 1999) and China (S. Fan et al 2002), where they included infrastructure as a component of public spending on agricultural research and development, irrigation, rural infrastructure such as roads and electricity, and rural development. By means of state-level data they estimated the impact of different public expenditures on poverty alleviation and found – in the case of India – that government expenditures on roads had the largest impact on poverty reduction, as well as having a significant impact on productivity growth. This finding on the relative impacts and roles of different types of infrastructure corresponds closely to what G. Foley (1999) reported in his review of the partial impacts of electrification discussed in the following section.

Dong (2000) found a strong output response by Chinese farm households to a change in public expenditures when analyzing the effects of village sponsored infrastructure and social services.

A 2002 World Bank study in the Philippines (ESMAP 2002a) used survey data to estimate the benefits of electrification to the household in monetary terms in a much more comprehensive way than had previously been attempted. It focused data collection on regions that have rural electric cooperatives that distributes electricity to homes and businesses. It established that 28% of the households in the sample of cooperatives lack electricity. These households are –

not surprisingly – poorer and less educated than their electrified neighbours. However, by means of the survey carried out it was established that the non-electrified households express similar preferences for many of the things electricity can provide, such as better lighting. In fact, it was established that both electrified and non-electrified households spend about the same proportion of their monthly income on lighting service.

Critical to this ESMAP (2002) analysis and its subsequent use in calculating benefits in monetary terms is the separation of electricity from the many other factors that affect socioeconomic outcomes, such as income, level of education, and returns to household investment in education. The analysis also included the effect of on entertainment, time spent performing household chores, health, and home-business productivity. The results of this analysis are presented in terms of the *hypothetical gain in benefits that would accrue to a typical non-electrified household were it to obtain a connection to the grid system.*

A major conclusion from this ESMAP study is that the benefits of electricity are derived from a variety of sources, some of which overlap. One must therefore be careful to avoid double counting of benefits. Education benefits can illustrate this point: Education benefits may result from better lighting, which makes improved reading and longer homework possible. Education is also linked to having access to improved, inexpensive communication sources, such as grid-powered radio and television. However, one could assume that the non-lighting benefit categories are reasonably independent of each other. Under that assumption, the total benefit of providing electricity to a typical, non-electrified Philippine household would be USD 81-150 per month, depending on the household's number of wage earners and whether it runs a home-based business.. This amount is well above the price households pay for electricity service.

S. Chowdhury and M. Torero (2005), in one of the most carefully structured econometric studies of infrastructure impacts so far, established on the basis of Bangladeshi household data that households living in a village connected to a paved road earn a higher proportion of their income, on average, from non-farm activities compared with households living in villages not connected to paved roads. Similarly, the availability of electricity or public telephones may also make a difference in favour of non-farm activities. Their results also support the likelihood that infrastructure, particularly village level electricity, has created employment opportunities, particularly in the non-farm sectors. In villages with electricity, a higher percentage of household heads were employed in non-farm activities and in the secondary and tertiary sectors compared with villages without electricity. This observation is compatible with the plausible assumption that both direct and indirect employment may result from the availability of electricity, since electricity is an important input in the development of many secondary and tertiary activities. The econometric regression analyses they carried out on their household data showed clearly that access to public telephones has an important effect on the time households allocated between agricultural and non agricultural activities. Other types of infrastructure have no significant effects on their own, but positive effects (complementarities) result when more than one form of infrastructure is available, e.g. electricity only has a positive effect when combined with access to roads or telephones. This is consistent with both other results from this Bangladesh study and the findings reviews by G. Foley (1999) for Norad.

4.3 The Complex Energy - Development Nexus

It is now increasingly understood that healthy and well-functioning cities are essential to the well-being of the peoples of the rural areas around them. Not only will a well-functioning city create good markets and attractive prices for what rural producers deliver, but a high level of well-functioning urban electrification makes it a lot easier financially and politically to embark upon rural electrification in poor rural areas. The primary role of the state is to create an attractive and stable climate for investment and lay down "the rules of the game" for the supply and demand actors. Furthermore, the state must develop long-term strategic objectives and priorities for electrification. This includes having in place a regulatory agency that is free of political interference and has the authority to carry out its tasks effectively.

Until quite recently, rural electrification used to be seen as a major driving force for rural development. However, based on a combination of circumstantial evidence and careful econometric studies of time-series and cross section household expenditure and living standard data, it is now more cautiously viewed as an enabling factor rather than a direct cause. Subsistence level rural household surveys worldwide, including Sub-Saharan Africa, a.o. ESMAP surveys in Uganda and Zimbabwe[12], suggest that *electricity is not a basic necessity for survival and not a listed priority among poor households*.

Energy, however, is a basic necessity. In rural areas where wood is scarce, poor people may pay for fuel-wood or shift to less efficient energy sources such as crop residues or dung, which have an opportunity cost in their roles as fertilizers that enhance crops and retain the productive value of the soil. It is quite common for a rural household in a developing country to spend an hour or more a day collecting wood or other fuels, see World Bank (1996). This often means forgoing other productive or human capital enhancing activities. Therefore, the traditional fuels collected and used by poor people are not free; to the contrary, they come at a high cost in cash or in labour, see J. Saghir (2005), p.4. Moreover, poor rural households spend a much greater share of their income on energy (8%) than do wealthier rural households (less than 3%), but the composition of their energy consumption changes towards electricity and LPG as income grows, see ESMAP (2000).

As rural household incomes increase, expenditure on energy grows, at first in the form of demand for dry-cell batteries and better quality kerosene lamps, and rechargeable car batteries for small TVs. Comprehensive ESMAP surveys referred to in the review show that the electricity share in the household energy bill increases with income, and the next level of supply options (small diesel generators, photovoltaic solar power and wind power) start to become economical. The review provides a good overview of how rural energy demand at the household level increases and becomes more diversified with income.

As regards long-term development effects, the report notes that "*there is no doubt that many areas in which rural electrification programmes have been implemented are very different ten or twenty years afterwards.",* p. 34 in G. Foley (1999), op.cit. This observation is taken from many studies of the impacts of rural electrification. The application of the IFPRI model by S. Fan et al (1999) to India explicitly allowed the estimation of time lags for infrastructure and other investments to have their maximum impact on poverty reduction, and found the time

[12] ESMAP (1998), *"Uganda: Rural electrification study.* The World Bank. Washington D.C. and ESMAP (1998a), "*Zimbabwe: Rural energy and rural electrification study: Strategic framework and policy alternatives."* (draft) World Bank, Washington D.C.

lags to be seven years for power and roads and eight years for irrigation, 11 years for education, and 13 years for agricultural research and development.

However, rather than electrification causing development, it is development up to a certain level and diversification which creates the conditions under which demand for electricity – using services emerges and grows. From that level of development *"rural electrification may well accelerate growth, but this is not necessarily the same as saying that it is a precondition for rural economy "take-off" into the growth process."*.[13] This conclusion is strengthened and confirmed by the fact that in areas which are prematurely electrified, there has been little impact of any kind since the proportion of households connecting onto the grid is so small when the level of economic and social development is too low and narrow. Some regions may not be ready to take advantage of the myriad development benefits of rural electricity, but no one would argue that there can be development without it.

There is no contradiction between the above development impact conclusion and the conclusion that there are significant benefits of an electricity supply to a family which previously had to rely on candles, kerosene lamps, dry cell batteries and car batteries. Households experience a marked improvement in their living standards as soon as they obtain electricity supply. The more they invest in further house-wiring and additional appliances, the greater the benefits become. The biggest improvement is in the quality of lighting, and there is extensive survey evidence (however not referred to in the review report commissioned by Norad) that extended hours of good reading light has contributed significantly to the performance of schoolchildren and students, and has helped to increase the likelihood that girls complete their schooling and women in the households become literate.

The review concludes, however, that often claimed health and education benefits from provision of electricity to clinics and schools by and large are exaggerated. Energy is a relatively minor input into the production of health and education services and there exist close substitutes to electricity that will secure an adequate level of such services. Rarely, if ever, has this been a serious obstacle to their provision or improvement up to quite a high level (G. Foley (1999), op.cit. p.39. Where trained personnel and medical supplies are available, perfectly acceptable health services can be provided because there are reliable and cheap energy alternatives to grid electricity available for refrigeration, etc, and most clinic work – especially that which addresses women and children - takes place in daylight anyway. In the schools the main constraints on provision of good education is a shortage of good teachers, books, adequate buildings and teaching equipment. Provision of electricity supply at schools can not make up for a deficiency in the fundamental requirements.

The above development impact findings points to the importance of applying the economic justifiability test as a key success criterion even if all the other criteria have been added over the years. The review notes that electrification investments are better deferred until the time in terms of development level is ripe for such investments. And even then, **electrification in itself is not the key factor in development even if it certainly can be observed to shape and influence the development process as it occurs.** To take advantage of electricity provision, households, farmers and non-farm rural enterprises must have sufficient income to buy the appliances and implements that use electricity and such levels of income must have been established as a result of other development processes prior to rural electrification. Entrepreneurs and farmers, for example, will not invest in such electricity driven output

[13] Pearce, D.W. and M. Webb (1985), "Rural electrification in developing countries". Dept of Political Economy, University College, London.

enhancing implements unless there is sufficient market demand within reach for their increased produce. It is important to note that electricity and energy supply constitutes but a small portion of overall investments and input services needed to meet such increased output demands.

The power sector reforms as such have not been specifically designed to deal directly with poverty related issues, but trickle down effects have been hoped for, and indeed been observed in e.g. Ghana, South Africa and Mali, where it is documented that reliable electricity supply has led to establishment of new power-based small scale enterprises as diverse as welding, sewing, telecommunications, bread making, ice making, battery charging and hair dressing, ESMAP (2005). Even so, the ESMAP review agrees with the G. Foley (1999) review that **there is little evidence to suggest that power price reforms have had a significant impact on economic growth**. These reviews also suggest that industrial willingness to pay is generally high, given the level of other input prices and the high cost of un-served demand. However, the lack of reliable and stable electrical power is one of the most important barriers to investment, see e.g Brandtzæg and Hansen (2006), fig. 3.1.

4.4 Development impacts of electrification: Nordic aid experience

4.4.1 The case of Namibia

Norwegian support for the former Owambo region in Northern Namibia started in 1991. This programme was first reviewed in 1992 (T. Westeren and C. Tapscott (1992)) and subsequently after completion in 1995 (M. Davies and S. Nghikembua (1995)). This region houses around 50% of Namibia's population, and at the time of the review, only 8% of the Owambo population lived in towns and surrounding peri-urban areas.

The main impact conclusions from this review listed below are very much in line with what has been reported from the international experience above. It is apparent that electricity in itself is an insufficient condition for the promotion of income generating enterprises. Wood is the principle fuel used in the vast majority of households and is used for water heating and cooking. Household access to electricity has only a relatively small impact on cooking and heating patterns, but high value fuels for lighting and electrical goods are rapidly displaced by electricity once connection is provided for. Based on field work, interviews and a questionnaire to stakeholders they draw the following conclusions:

The household sector:

- Less than 2% of households in the region had access to grid electricity before the electrification project, and this percentage only marginally increased as a result of the project simply because of the low population density and the dispersed nature of settlement patterns in the area. As a result, grid electricity is unlikely to extensively address the direct energy needs of rural households.
- Energy use in households remains similar to that reported in a 1991 survey prior to the project. Access to fuel-wood is by far the most important energy issue faced by the majority of households.
- All electrified households feel they have saved money on energy as a result of being connected, but for the most part they only use it for lighting. Households appreciate streetlight, that electricity is clean and provides flexibility.
- households complain about electricity being dangerous to use, and that appliances and prepayment cards are expensive.

The public sector:

- The main electrification impact in the public sector (schools, clinics, police stations, government accommodation, water pumping stations, etc) was savings in operating and maintenance costs related to the diesel generators that grid electricity replaced, and improved reliability,
- The impact of electrification on primary schools was found to be limited since electricity use was restricted to only very few appliances, while secondary schools made extensive use of electricity in administrative offices, hostels and classrooms, but the main impact was not access to new implements, but cost savings and more reliable electricity.
- The same impact conclusion applies to hospitals and clinics, where it was found that new refrigerators were purchased in many clinics to better preserve medicines and where more reliable lightning improved working conditions at night,
- The Department of Water Affairs (DWA) turned out to be one of the main beneficiaries of electrification. In addition to replacing pumps based on grid electricity for costly diesel operated pumps, it opened up for installing automatic control of pumping equipment. Furthermore, theft of PV panels has always been a problem in African settings, and this problem is solved when grid electricity is provided.
- In government housing accommodation for nurses, doctors, teachers, extension officers, etc. electricity availability is highly appreciated and it is used extensively (even for cooking) and more now that costly diesel generators have been replaced with grid electricity.

The commercial sector:

- As found repeatedly in the international review above, this Namibia review also found that very few income generating productive enterprises were encountered. While having an opportunity to create new small businesses which use electricity, there are a number of other obstacles unrelated to electricity supply – whether grid- or diesel-based - that need to be overcome before such investments take place, see section 4.2 and Chapter 5 below.
- For the small retail shops, grid electricity had improved service levels, but not necessarily improved sales. Larger retail traders had found more applications such as refrigeration and electric cash registers, and even computer equipment, and filling stations had converted to electric pumps.

Financial and economic impacts:

- The economic benefits are primarily attributable to the savings on operating diesel generators.
- Prepayment metering has been a success and is popular with residents.

Environment impacts:

- Deforestation is considered a serious problem in Namibia, but deforestation has not been affected by the electrification programme at all. This is partly because fuel-wood collection is not the principle cause of deforestation, and partly because very few households have access to electricity and use fuel-wood for cooking purposes.

In addition, the review concluded that:

- The planning in the Norad-funded phases (1 and 2) appears to have been heavily supply-side dominated, and the lack of needs assessments and participatory planning arrangements has been a weakness of the planning and implementation phases.

4.4.2 The case of Mozambique

Sweden funded the external costs of rural electrification implemented by Electricidade de Mozambique (EDM) in the area of Ribaue/Iapala in the Nampula Province in Northern Mozambique the 1990s. The project aim was to improve and promote infrastructure development through rural electrification. The first stage development allowed for approximately 1,000 domestic, five medium- and 20 small-scale industrial and commercial consumers to be connected to the existing EDM grid.

All the above described presumed development effects from such investments were anticipated by commercial agents, local industries, workshops and craftsmen who claimed they intended to start new activities following the electrification. They had also claimed ability to finance installation and future consumption of energy. Agriculture output was expected to increase as a result of the electrification, and public services (schooling, hospital and clinic services etc) would be available more timely and efficiently.

However, the socio-economic and gender study carried out in 1997 (Åkesson (1997)) concluded more in line with the rather sobering development impact studies cited in 4.1.2 above:

- The number of domestic connections will be limited due to relatively high costs for installation and connection. The study did not address the possibility of subsidized connection and installation and allow a slow payback via the payments for use of electricity, perhaps because:
- The vast majority of households to be connected will use electricity for lighting only, (as found in the case of Namibia above).
- Most households will continue to use firewood as their main energy source for cooking (as found in the case of Namibia above).
- Few can afford to buy electrical appliances or pay for high consumption,
- Female headed households will probably be less represented as most of them lack economic resources. In addition, women feel more concerned about the risks connected with the use of electricity in houses that are wattle and daub constructions with thatched roofs, and that require special protected installations for safety.

Norway has funded the Namacurra Rural Electrification Project in Mozambique as part of an ongoing electrification effort in the Zambezi Province. The current agreement for NOK 45 million was signed in late 2001 for 2001-2003, with an extension of NOK 12 million in 2004, and expected completion was 2005. This project is a significant component in EDM's long-term strategy of providing relatively low-cost power through grid extension to rural areas.

Scanteam (2005 August) reports in its review that overall efficiency and effectiveness of the project so far is good. However, whereas the project is well-defined in scope, properly implemented and supervised and expected to be completed within the budget and time-frame, and is expected to have a measurable result and overall positive impacts on local economic and social development, it is unfortunate that no baseline studies for the purpose of counterfactual, or before – and after assessments have been conducted in any satisfactory manner. The social component in the environmental impact study does not suffice in providing the required verification data.

With very few customers available to be served, the connection cost per customer is as high as NOK 47,000, and this is not due to low efficiency or overpricing practices, but simply due to the demographical and geographic characteristics of the project area (few people and long distances). From a cost-efficiency perspective the provision of lighting, which is first and foremost what most poor rural and peri-urban households demand, could be served at much lower costs with solar PV cells. The benefit of extending the grid to the said area is that it provides for virtually unlimited number of house connections in the future once it is in place.

The benefits to the stakeholders – both the type of benefits, their importance and limitations are found to be of the same characteristics as the two Nordic-funded rural electrification projects described above for Namibia and Mozambique, and the bulk of other international experience described in Section 4.1.2 above.

Scanteam (2005 August and 2005 December) also reviewed the Gurue-Cuamba-Lichinga Transmission Line and Distribution Project in Mozambique which was jointly funded by Sweden and Norway with an overall allocation of NOK 320 million (Norway's share was NOK 189.1 million) and with Norway as administrator of the grants from both countries. Construction work started in 2002, and completion was planned for end of 2005. The project was an integral part of EDM's long-term strategy of extending the national grid to all district capitals and other centers, and the goal was increased economic activity and enhanced living conditions in the area influenced by the project. Even with highly satisfactory donor coordination and indications that the overall projects will be completed with significant savings relative to original budget (in spite of severe start up delays), connection costs per customer at the present is very high and connection rate are very low (as for other electrification projects in poor African settings described above). The argument for pushing through has been the same as for the Namacurra rural electrification project discussed above, e.g. a very long-term electrification perspective.

Scanteam (2005 December) in it's review of Swedish power sector aid to Mozambique also examines the development effects of the Sofala, Manica, Tete Provinces Rural Electrification Projects so far. The detail design for these projects was completed in April 2005 and Sweden has made available a grant of SEK 105 million the Government of Mozambique for this purpose so that EDM may borrow from the Government on concessional terms. The assessment concludes that the open tendering process will result in cost-efficient implementation. However, as for the previous electrification projects in Mozambique, the field study of the socio-economic situation reveals that a very low percentage of the population in the affected area is going to get access to electricity due to poor affordability among stakeholders. As a consequence, and in line with the conclusions from other electrification projects in Mozambique reviewed, the low access rate makes the project very expensive in terms of connection costs per household, but at the same time, the potential for future connections is large, and costs of access in the future will be much lower. In Mozambique rural electrification is first and foremost seen as a social activity and short-term economic viability is not considered a priority criterion for project selection.

4.4.3 How electrification changes people's life: Experience from Zanzibar

Norway has supported electrification of rural areas in many low income countries. A recent Norwegian social anthropological PhD thesis seeks to describe and explain how electrification changes life in a Zanzibar village, see T. Winther (2005). Unlike conventional appraisals and

project-related ex-ante impact studies, this type of research goes "behind the scene" and seeks out "grasroot" perceptions and views by means of long-term field work where a relationship to the local stakeholders is established.

Unsurprisingly, this research establishes that the local political context is crucial to the outcome. This is done by comparing two Zanzibar villages. One where the inhabitants were prepared for electricity provision and as a result saw its coming as and icon of development. The other, a nearby village through which a high voltage line would pass, but without a local transformer in place these people were unprepared for electrification and what it implied.

Preparing local African communities for successful development effects of electrification requires that those promoting and implementing electrification programs become familiar with local perceptions and superstitions. In the case of Zanzibar, this research established that these changed dramatically with respect to roles and impacts of electricity between 1988 and 1998. Establishing a dialogue about the role of occult and sacred phenomena with local leaders and establishing a proactive dialogue about the electrification process and what it can mean to the community and its people is a well worth effort. T. Winther (2005) establishes that the coming of electric light modifies the relationship between people and spirits at night time, but electric light does not alter the spirits whereabouts all together. It is a myth that witchcraft disappear quickly with electricity in Africa.

Another observation not often mentioned elsewhere in studies of impacts of electrification, is that customer relationships, which are based on contracts and responsibility for honoring bills rests with named individuals. This contrasts to the rather diffuse ways in which other kinds of objects are purchased and how they become shared in everyday use in many African communities. With electricity – often used by the wider social group jointly – the paying commitment rests with the individual who has signed the contract. For the male of the household to be fully responsible to pay the bill for what is shared among many, can be a new and difficult experience, and in many cases one has observed that invoices accumulate and remained unpaid, perhaps in part due to this unfamiliar cultural change. The recent observation that couples increasing share the electricity bill may, however, be a sign that old gender roles are about to change in response to new social rules and practices.

T. Winther (2005), p.306, establishes that by pushing the process too hard to achieve the promised development (often a result of a tough negotiated contract between contractor and consultant on the one hand, and the utility and government on the other), non-development may be the result. This in fact was the outcome in the one village studied in this research. This underlines the importance attached in development assistance more generally, namely to allow sufficient time for the development process to mature so that local ownership of it is established.

Unsurprisingly, this research confirms much of the development impacts cited from international research more broadly, and which has been reviewed in Section 4. 2 above. In the case of these Zanzibar villages T. Winther (2005), p. 310-312, establishes that:

- In line with governmental goals, electricity has brought stable water supply and simplified the villagers access to water tremendously,
- Women and girls now spend much less time fetching water and buying kerosene,

- Electricity has greatly improved the quality and safety of local health services by providing power for refrigeration and safe water (however, diesel generators could have provided for the same (authors note)),
- The most frequently celebrated aspect of electricity's arrival in the village is the provision of electric light both outdoors (street and community safety) and indoors (for extended time to work, study and leisure activities),
- Watching television is a new habit that entails both entertainment and education dimensions,
- Electricity as a substitute for kerosene and batteries is considered an economic benefit,
- Cold drinks is considered an important convenience benefit from electricity,
- Men's age of entry into marriage has been delayed as a result of electrification of houses, as it has now become more expensive to provide a proper house for a wife.
- Houses also become more expensive because electrification leads to use of more expensive electricity-safe building materials,
- Since such houses tend to be more concealed, this has led to increased demand for electric fans,
- Electrification of households and the changed lifestyles after dark has also influenced sexuality and reproduction. As electricity facilitates education and expands opportunities for women, their interest changes from producing more children to providing for better education opportunities for a smaller number of siblings.

At the same time, T. Winther (2005) finds that for many of these development impacts of electrification to materialize, other complementary infrastructure elements and supplies to operate these infrastructures also must be in place and operational, see discussion on complementarity between different infrastructure components below. Related to this is the observation that the emergence of new commercial enterprises and small sale activities resulting from electrification has been rather modest. Tourism appears to be the one industry that holds the greatest potential for expansion based on electricity in this area.

4.5 Paying for Electrification – the Affordability Issue

4.5.1 The international experience

There is no consensus of views on what "affordability" means. Ultimately, therefore, the concept is quite subjective. Unlike the case for water supply and sanitation where the World Health Organization (WHO) has estimated that the maximum the poor should pay is 5% of their income, in the case of electricity there is no such widely accepted "rule of thumb" to access affordability. In general, empirical household expenditure surveys worldwide show that the budget share spent on basic necessities decreases as income grows, whereas budget shares on luxury goods and services increase. Water and sanitation are typical cases of basic necessities along with staple food and basic shelter. Basic energy is also a necessity, but both because of the scope for substitution from costly alternatives such as diesel generators, kerosene and batteries to network electricity, and because electricity open up for consumption of goods and services not available without electricity, and because tariff structures can be designed to protect the poor, the "Engel Law" of declining budget share with rising income is not immediately discernable for electricity consumption.

It has been estimated that in non-African developing countries, electricity consumption takes up about 4% of income on the average and decreases across income quintiles and thus

supports the basic necessity hypothesis, see Komives et al (2005). For a sample of 15 African countries where network electricity consumption expenditures are available, the poorest spend as much as 7.5% of their income (but 4.9% as the average for this group), and this percentage then declines as income rises to 4.1% average for the richest quintile. Since the sample is limited to those with network access, it is reasonable to assume that those with electricity from batteries, solar panels and own generators pay an even larger share of their income. One conclusion to be drawn from this observation is that tariff structures in African countries by and large have been less sensitive to the affordability and ability to pay among the poor compared to tariff structures adopted in other regions.

The available household survey results for Africa suggest that:

- Users who are connected to a network do not have a major affordability problem,
- Users who are not connected often do have a major affordability problem,
- Around 50-60% of the population is not connected to a utilities network, and
- The population not connected tends to be among the poorest income groups facing an affordability problem for utility services
- In Africa the idea of relying on private operators concerned with full cost recovery without any subsidy component would be incompatible with network coverage expansion efforts..

The dilemma of rural electrification for developing countries is that those in the country that already have electricity are fairly well off and very demanding that their service be continued at the lowest possible price. The populations that do not have electricity are poor people living in regions where it is expensive for distribution companies to serve. Since the former group of inhabitants tend to have more political influence than the latter, the thankless task of the electricity companies involves keeping their existing customers happy with the highest quality of service, while at the same time making the expensive investments to provide electricity for the remaining people of the country at costs that are affordable to them (ESMAP (2005a, p. 343)).

In addressing how to finance and pay for rural electrification, G. Foley (1999) focuses on subsidy issues and tariff structures. Worldwide, all rural electrification programmes have involved some form of subsidy. The analysis starts from the fact that investment, maintenance and administrative costs of rural electrification networks are usually well in excess of those in urban areas and describes the many different factors that explain why this is so (G. Foley (1999) op.cit., p.53). For all of these reasons private supply companies and even national power utilities generally avoid rural electrification in poor countries unless the government compensates them in the form of capital and/or operating subsidies. The many failures and success over the years have provided some lessons for the future (G. Foley (1999) op.cit. p.55-56):

- Establish from the outset how to fulfil interest and debt repayments obligations, e.g. through initial connection fees, a fixed element in the consumers' electricity bills, a capital levy on the unit price of electricity, or a combination of these.
- The utility's tariff system must enable it to cover it's debt repayments and operating costs. Tariff regulating authorities must provide for that customer charges can keep pace with inflation and currency depreciation.
- By confining subsidies to the initial capital investment the viability of the supply system is not jeopardized provided it is properly run and proper tariffs are set, even if the source of cheap capital dries up.

- Relying on operating subsidies is, however, a dangerous option that time and again has proven to lead to acceleration of deterioration of service and collapse and threatens the sustainability of the supply system .
- The provision of concessionary capital for rural electrification to utilities which are not covering their operating costs is a financially lethal combination which should always be avoided.

Affordability and how it is handled can be a cause of success or failure of a rural electrification scheme. Connection costs are likely to be too high for the majority of poor rural households to afford if it has to be paid cash in the form of an initial charge and thus result in the majority of potential rural dwellers to link up to the system. Innovative ways of recovering the connection costs from such consumers are needed.

Ghana's Self-Help Electrification Programme is an interesting illustration of how such a dedicated parallel initiative can have an impact, see ESMAP (2005). The programme offered to connect communities within 20km of the existing network provided they could demonstrate a minimum number of interested households and provide the required low-voltage wooden distribution poles. This program has been so popular, particularly among smaller communities, that it had to be divided into several phases so the government can meet demand. However, in reviewing its sustainability and transferability to other settings, one would need to analyse the reason for the large number of voluntary disconnections, apparently due to affordability constraints. This possible explanation is supported by the observation that per capita electricity consumption has fallen while at the same time the access increased 500% during the 1990s. It is poverty that limits the use of electricity and many poor households continue to use traditional fuels. However, it is not clear if it was price level or quality and reliability of service that lead to disconnection and fuel switching.

In the case of **Central America**, ESMAP (2004a) p.62, reports that with the exception of **Guatemala**, most rural electrification funds that were established from the proceeds of the sale of shares or assets from privatized distribution systems have not been used for their intended purpose. In some cases they have remained unspent, in other cases they have been used to finance other government programmes. And where such funds have been allocated and used for rural electrification, little work has been done to assess whether or not the level of subsidy per new household is appropriate.

Several countries have adopted relief systems such as government subsidies to IPPs or the utility in order to dampen the social hardship that reform-induced price increases may cause **(Ghana, Mail, Tanzania, Uganda**). Cross subsidies have been adopted for this reason in **South Africa, and Ghana, South Africa, Tanzania and Uganda** which are examples of countries that have adopted "lifeline" tariffs that supply a limited quantity of energy at a subsidized rate. However, ESMAP (2005) has observed – in line with the findings of G. Foley (1999) in his overview report for Norad – that lifeline tariffs do not always benefit the poorest of the poor, because they target populations that already have access to electricity instead of using available funds to expand access to the poor. With access rates of 10-20% or less, maintaining low residential tariffs benefits only a minority of the population – and inevitably subsidizes the wealthier (albeit far from rich by western standards) portion of the population, because it is this community that is more likely to have electricity supply. As such, subsidised residential electricity tariffs represents a poorly targeted and regressive subsidy.

From the outset, rural electrification subsidies should be designed so that they are easy to administer, have an impact on the desired population, and reach the poorest of society. ESMAP's (2005a) latest comprehensive review of successful rural electrification experiences, show that most of these criteria are met in the reviewed programs (**Costa Rica, Philippines, Bangladesh, Thailand, Mexico, Chile, China, and Tunisia**), but none of these are found in Sub-Sahara Africa.

Based on the rural electrification program experience from these eight developing country success stories, ESMAP (2005a), p. 344-345, concludes that *"the types of subsidies for rural electrification have been many and varied in the most successful programs.....thus, the form of subsidy might not be as important as the way in which such subsidies are administered"*.

- In several of these cases there have been arrangements for capital subsidies for new connections that have worked well, where the distribution companies have been required to cover the operating costs of service through revenue collection.

- Establishment of a subsidy fund which is open to new and old distribution companies for grid and off-grid options, provided they can prove that they can reliably service poor new customers has proven successful in e.g. **Chile**.

- Even bulk power subsidies – which theoretically is economically inefficient – has been applied successfully in e.g. **Thailand** where the bulk power supplier was able to recover the subsidies with higher prices to an urban company.

- Within electric companies that have both urban and rural consumers, lifeline rates and cross-subsidies have in several cases been an effective policy for encouraging rural consumers to adopt and use electricity. Those that are properly related to the poverty profiles of consumers have been able to easily absorb the subsidies for the poorest consumers without causing financial difficulties for the companies.

Poorly performing rural electrification programs applying lifeline rates have usually been characterized by a lifeline rate set so high that it compromises the financial viability of the companies serving rural consumers. The programmes in which rural electrification has been problematic generally have not attained the balance between too little or too much subsidy. ESMAP (2005a) finds that the programmes with too little subsidy generally are aimed mainly at the more wealthy households and refrain from extending electricity to the poor. The programs with too much subsidy often become so dependent on the subsidies that they forget that the goals is to serve paying rural customers.

The ESMAP (2004) review of it's experience from it's rural and renewable energy portfolio activities from 1997 to 2002, concluded that financing sources from local institutions and governments can play an essential role in meeting the huge financing needs for scaling up energy access and renewable energy. The lack of access to credit from local financial institutions, however, proved to be a primary constraint to rural energy projects in many countries. Where there is sufficient liquidity in the commercial banking sector, the critical factor for releasing financing for such projects (assuming they are proven to be financially sound) is the presence of financial intermediaries between project developers and financiers, to bridge the knowledge gap between the two, and bundle small-scale rural energy and renewable energy projects to reduce transaction costs. Technical assistance and limited financial assistance to local micro-finance institutions can be critical, as was demonstrated in

an ESMAP project in **Kenya**. Local micro-finance institutions are often well suited to finance locally tailored low-cost, small-scale renewable energy systems that are affordable to low-income populations.

When it comes to unit charges/tariffs for the electricity consumption there is a widely believed myth – as is the case for water consumption as well – that rural people and urban squatters are too poor to pay the true price of electricity. There is every reason to demonstrate to decision-makers and influential NGOs that this is nothing but an ill founded myth and that sustaining it is a key obstacle to the provision of electricity for the poor (as is also the case with reliable water supply for the poor). Poor rural households have been found to pay USD 10 per month for batteries and kerosene and for this amount the could buy 50 kWh even at USD 0.20/kWh which would provide for a much higher level of service than what they have been accustomed to. Evidence from poor rural households in **Uganda** and the **Philippines** reveal that the willingness to pay for electricity far exceeds such tariff levels.

An important conclusions based on the findings from the comprehensive ESMAP (2002) study of measuring the social and economic benefits from rural electrification in the **Philippines** is that the willingness to pay for electricity service is high, especially compared to the cost of providing service to rural areas. This suggests that, with appropriate financing, subsidies can probably be reduced more than was originally thought. However, one cannot generalize the Philippine findings unconditionally to e.g. sparsely populated isolated and inaccessible poor rural communities in Africa. Such willingness and ability to pay for power must be established case by case.

The **Bangladesh** Solar Home Programme on Credit Sales, see C. Ratnayake (2005) also demonstrate that rural people with limited means place a fairly high value on basic lighting service and is prepared to pay a considerable portion of their income on such a service. This is fully in line with the findings from the international electrification impact review above. While the results of the monitoring and evaluation exercise is still not in, field visits conducted indicate the high satisfaction with the service from SHS systems and the impact on the livelihood and living standards of rural people.

4.5.2 The Norwegian aid cooperation experience

The Norad financed electrification of the rural areas in the former Owambo region in Northern **Namibia** which started in 1991 was reviewed after completion in 1995 (M. Davies and S. Nghikembua (1995)). The demographic and geographic structure of this region along with its socio-economic characteristics suggests that the costs of providing connections to households far exceeds their ability as well as willingness to pay for such. The international practice as reported above is increasingly to use surplus revenue from high income consumers in urban areas to pay for the deficits incurred from low income consumers in peri-urban and rural areas, so also in Northern Namibia, except that the ratio of relatively well-off urban households and commercial enterprises using electricity, to poor rural households is extremely high. In short, it would not be possible to run an overall profitable electricity supply operation covering the entire region, and the bulk supplier is not prepared to take on such risky operations without public guarantees of loss coverage. General budget support would thus be required to expand rural coverage.

A major challenge related to power provision for the poor is to establish a system that is satisfactory to clients and at the same time secures full payment for the power consumed, and furthermore can reduce theft from the lines and corrupt practices from utility employees. As a

small part of the comprehensive long-term institutional cooperation agreement between **Mozambique** and Norway in late 1992 was for testing new technology for reducing loss of power from transmission lines, non-paying clients and inaccurate metering by improving the quality of metering calibration. Under this agreement EDM, the national utility, decided to carry out a pilot-project in order to test a new metering system on a group of 500 clients in the city of Matola. This metering system includes a sales station that measures the energy consumed by each household. Each household has to pay in advance for the energy it wishes to spend. When the prepaid energy is spent, the client is cut off from the net. A new pre-payment is required to be reconnected. The sales office was available with opening hours to provide immediate service in order to avoid interrupted power supply. It is of interest to observe that the clients who were elected to participate in this pilot project were very satisfied and this system is therefore worth taking seriously for application elsewhere, even if it did not materialize at that time in the city of Matola.

Connection costs and affordability are key issues not adequately addressed in other Norwegian funded rural electrification projects in Mozambique such as the Namacurra Rural Electrification Project which is part of an ongoing electrification effort in the Zambezi Province, see a description of it in Section 4.2 above. This project is a significant component in EDM's long-term strategy of providing relatively low-cost power through grid extension to rural areas.

However, with very few customers available to be served and a very low income and affordability per household, the connection cost per customer is as high as NOK 47,000, and this is not due to low efficiency or overpricing practices, but simply due to the demographical and geographic characteristics of the project area (few people and long distances). From a cost-efficiency perspective the provision of lighting, which is first and foremost what most poor rural and peri-urban households demand, could be served at much lower costs with solar PV cells. However, the electricity supplied from the new lines is cheaper than from the local diesel-driven power stations. This means that more people would be able to afford electricity.

The benefit of extending the grid to the said area is that it provides for virtually unlimited number of house connections in the future at low marginal costs once it is in place.

The benefits to the stakeholders – both the type of benefits, their importance and limitations are found to be of the same characteristics as the Nordic funded rural electrification projects described above for Namibia and Mozambique, and the bulk of other international experience described in Section 4.1 above.

4.6 Connection Fees and Use-based Tariffs: Stakeholder Impacts

4.6.1 The international experience

There are many tariff structures in use and many have been designed with progressively rising block tariffs on equity grounds and implies a cross-subsidy from high demand consumers to low demand consumers. At the same time, it can serve as a deterrent to excessive consumption since the electricity price is higher the more is consumed. Some such tariff systems apply – again for equity reasons – a so-called "lifeline tariff" for the first block which is set below actual supply cost. G. Foley (1999) op.cit. found in his review that this is likely to be ineffective and inefficient also from a poverty reduction perspective, because the dominating deterrent is the connection fee and not the cost-based tariff. For a given budget for

redistribution between different user categories, equity would be far better achieved by subsidising the connection fees of the poor in order to have as many subscribers as possible, because almost everyone can afford and are willing to pay the cost-based tariff once they are connected.

The simplest system is a single price per kWh irrespective of consumption level designed to cover the full operating and capital expenses of the utility. Such a user tariff removed the entry hurdle imposed by a connection fee and initial deposit fee that has served as a deterrent to so many poor rural households. Furthermore, such a tariff means that users pay for initial investments and fixed costs in proportion to how much they consume, and was adopted by Eskom, South Africa's national utility. All tariff systems based on measured consumption require the installation and monitoring of meters. For low levels of consumption these costs can be disproportionately high relative to actual user fees charged. For this reason some utilities have resorted to so-called load-limited tariffs whereby actual consumption is not metered. The consumer pays a fixed fee based on the rating of the connection irrespective of the amount of electricity consumed. Against the cost-saving advantages must be assessed the lack of incentives to save on electricity use and the possibility that users find ways of bypassing the system.

Cross-subsidies applied to make electricity affordable to poor rural consumers need not be in itself an obstacle to successful rural electrification, provided the consumer charges overall (urban, industrial and rural) are sufficient to meet the financial needs of the electricity supply organizations concerned. In many countries (although less so in Sub-Sahara Africa than in e.g. South East Asia) the cost of cross-subsidy provided to poor rural communities which is paid for by urban consumers can be very low indeed, as reported by G. Foley (1999), p.56, for Thailand and some island cooperatives in the Philippines. However, for effectiveness and significant rural electrification impacts to materialise among poor rural and peri-urban households, the ESMAP studies reviewed (ESMAP (2004)) found that the resilience of the system is much better when subsidies are used for establishing the system and facilitating consumer connections, while the operating costs are covered by means of collected tariffs.

Experience has shown that electricity supply organizations depending on operational subsidies are critically vulnerable to any downturn in their availability (ESMAP (2005a)). When the operational subsidy is reduced, as inevitably happens, the virtue of increased sales turns into the vice of greater losses, creating a significant disincentive to extend electricity service to new customers, especially poor people. Sub-Saharan experiences provide sad examples. In Kenya, for example, where rural electrification programs depends on the availability of grant funds from donors, and the amended electricity act does not sufficiently address the issue of the electrification of the poor, and the utilities, Ministries of Energy, and regulatory agencies make no attempt to track electrification of the poor, progress has been very slow and intermittent ESMAP (2005a) p.349, and Karekezi, S. and J. Kimani (2004). In Malawi, the state electricity company states flatly that it has no interest in rural electrification, because electricity prices, by government order, are too low to cover even operating costs.

Perhaps the most detailed and thorough survey-based study of the stakeholder incidence of electricity tariff regimes is the one carried out in **Guatemala** by Foster and Araujo (2004). They focused on the question of who benefits from different types of tariff policies, and more specifically, on how effective different tariff policies are at protecting the most vulnerable customer groups. Their analysis was centred around three indicators of relevance to this policy issue.

- *Errors of inclusion*, defined as the percentage of the electricity subsidy beneficiaries who are not poor,
- *The leakage rate*, reflecting the proportion of the total subsidy expenditure that flows to the non-poor, and
- *Errors of exclusion*, defined as the percentage of the poor who are not subsidy beneficiaries.

Their study established that the post-reform tariff of USD 0.08 per kWh for monthly consumption up to 300 kWh, as compared to a full cost per kWh of USD 0.11 – 0.15 per kWh, and costing USD 50 million per year to sustain, resulted in non-poor beneficiaries constituting 65% of all beneficiaries, and receiving 90% of the overall subsidy as a result of the variation in monthly power consumption among different household income categories. While indeed the subsidy reaches all poor households with electricity connection their low monthly consumption results in only 10% of the overall subsidy reaching them. The remaining 60% of poor households without electricity connection derive no benefit from the subsidy scheme.

Since poor households consume much less electricity than non-poor ones, the cost-effectiveness of the social tariff scheme could be significantly improved by lowering the subsidy ceiling from 300 kWh per month to e.g. 100 kWh per month (which is still twice the level of what poor households consume). With this policy revision errors of inclusion would fall from 75% to 65%, the leakage rate would fall from 90% to 75%, and the errors of exclusion would rise only 0% to 8%, while the overall cost of the subsidy would be reduce from USD 48.9 million per year to USD 13.2 million per year. By lowering the subsidy ceiling to 50 kWh per month, the cost-effectiveness would be further improved since the subsidy cost on the budget would now be virtually eliminated, while the above described leakages would be much further reduced, and the subsidy much more poverty targeted.

The savings resulting from such policy change could then – if poverty reduction is a genuine goal – be allocated for affordable connections to poor households so far unconnected.

4.6.2 The Norwegian aid cooperation experience

Scanteam (2005 August) p.46, in its review of Norwegian and Swedish power sector aid to **Mozambique**, recommends that in order to achieve effective stakeholder impact in favour of poor electricity customers, power utilities should expand the use of pre-paid subscription cards with given validity from time of purchase to include differentiated levels of consumption at differentiated unit prices, so that the price per kWh for the lowest consumption per month category, e.g. 0-20kWh, is very low and affordable for the very poor households, while the unit price for cards providing for more power consumption per month is gradually increased to reflect both affordability and willingness to pay among the customers. Any surplus from such price discrimination can then facilitate socially based cross subsidization with minimal drain on e.g. state or provincial budgets. This recommendation is fully in line with international experience and recommendations from e.g. ESMAP (see Section 4.6.1 above).

Scanteam (2005 December) in its review of Swedish power sector aid to EDM in Mozambique concludes that the cross-subsidy concept could be applied to enhance sustainability if used to transfer revenue surpluses earned in the South to finance expansion of connections in the North and thus get unit costs down also there so that electrification can be

further expanded to stimulate economic growth and widening of the economic base. However, sustainability in this area depends crucially on the amount of surplus generated versus the level of cost of supply in the North.

4.7 The Incidence of Costs and Benefits: Effects on the Poor

G. Foley (1999) has an explicit discussion of project benefit components and their distribution among stakeholders. National electrification levels in **East Africa** are very low. In 2001 it was 2% in Ethiopia, 4% in Uganda, 6% in Kenya and 10% in Tanzania, but due to widespread rural poverty it was at or below 1% in rural areas in Kenya and Uganda[14]. At prevailing rural income levels in these countries the large majority would be totally dependent on free or highly subsidised connections, and many of them also on low cost access to the implements that would give them the advantages of electrification.

As regards the landless poor in rural **Bangladesh**, access to infrastructure (i.e. paved roads, public phone and village-level electricity) does not vary between landless and land-owning households, with the exception of electricity at home. Among landless households, only 15% had access to household electricity, whereas the percentage land owning households having electricity was 35%. Given this difference in access, S. Chowdhury and M. Torero (2005) have studied the extent to which infrastructure affects households with and without land. They estimated the returns from access to infrastructure, controlling for different household characteristics, and found that overall, infrastructure has a stronger impact on landless households. For example electricity may allow landless households to allocate more hours to non-agricultural income earning activities which have a higher returns than farm activities. Road access may enable them to work longer hours away from home.

R. Bhatia et al (2005), p.94-96 have studied the long-term income distribution and poverty reducing effects of three large dam projects in **India** and **Egypt** (the **Brazil**ian large dam project they studied did not have available data suited for distributional and poverty impact analysis). The key findings from the perspective of learning about long-term distributional development effects can be summarized as follows:

- For the Aswan High Dam in Egypt the estimated percentage increase in income levels with the dam project have been slightly higher (22%) for rural households than for urban households (20%) as compared to a scenario without the high dam. However, both for rural and urban households, the analysis indicates that the income gains from having the dam in place have been slightly larger for the upper income categories than for the lower quintiles.(20% increase for the two lowest rural qualities versus 24% for the highest rural income quintile, and a gradual increase in the percentage income impact from 15% for the lowest urban quintile to 22% for the highest urban quintile.

- In case of the Bhakra Dam in India, the percentage increase in income on rural households were considerably higher than for urban ones; 38% versus 17%, with the greatest impact being found for non-agricultural rural households (79%), followed by rural agricultural labour (65%) and self-employed rural households (42%) and "other rural" (20%). Thus the gains for the poorest rural households have been much greater than for the non-poor farming households

[14] S. Karekezi and J. Kimani (2004), "*Have power sector reforms increased access to electricity among the poor in East Africa?"* Energy for Sustainable Development, Vol. VIII No. 4, December 2004.

- For the Bunga Dam in India, the grouping of households was again different. The poorest households are found among the workers, the marginal and small farmers, but these three groups have gained differently around an overall project average gain of 43%. The workers have lagged behind with only 23% increase, whereas the marginal and small farmers (also both predominantly poor) have experienced an above average income gain of 50% and 59% respectively.

G. Foley (1999) points out that pressure on politicians for rural electrification to an area generally comes from the better off in rural society who also hold the influential positions in the community. While connecting the better-off households to an electricity supply will certainly improve their standard of living, it will have little, if any spin-off in benefits to the community at large and especially to its poorer members who cannot afford the connection. Provision of heavy subsidies for such schemes could easily end up exclusively to benefit of the better-off in society. Tariff subsidies are almost invariably socially regressive. This points to the importance of rural electricity funding and tariff structure in determining affordability of the community poor and thus the final distribution of rural electrification benefits among the various stakeholders.

High capital costs are the chief disincentive to supplying grid electricity to rural areas, and it is difficult to prescribe solutions that will make it affordable for poor rural households to link up to a grid unless subsidies are provided. The challenge is to design better subsidies and efficient ways to provide them, and this is an area where more analysis and research is needed. J. Saghir (2005), p.12, agrees with G. Foley (1999) in that it is becoming increasingly clear that operating costs should not be subsidized as a way to promote rural grid electrification. They argue that experience worldwide suggests that subsidies for capital costs are more sustainable and beneficial than those for operating costs. Output-based aid (OBA) is an approach being used to promote the effective use of public funds for the delivery of infrastructure services. With OBA the disbursement of public funding is tied to the services or outputs actually delivered to targeted groups, e.g. identified poor households. OBA can be particularly effective when targeted at providing electricity (or safe water) at affordable costs to the poor. The main barrier to affordability in rural areas, as identified by G. Foley (1999) and others is the cost of entry, or connection cost, and not the fee paid for actual consumption. Therefore, as J. Saghir (2005) points out, "*a good rule of thumb is to make grant subsidies available to energy service companies for investments in infrastructure access and, as necessary, some form of cross subsidy from better-off energy users to lower the costs of the most vulnerable populations.*"

The dominating barrier for the poor households – urban as well as rural – is thus cash or credits to pay for capital costs, initially the connection costs, but almost equally important the costs of acquiring household durables and implements using electricity and which can enhance both household- and workplace productivity and thus welfare levels. Therefore, another way to help the poor use more efficient fuels and electricity may be to provide them soft credits for purchasing such appliances and implements. Such subsidies may prove more efficient and effective and sustainable than subsidizing the fuel or electricity use itself, because it avoids distorting the energy market, J. Saghir (2005), p.16.

In urban areas the situation is normally different due to much higher population density and proximity to existing grid networks. Expanding electricity access to the urban poor is thus more a matter of regulatory policy that of connection cost. Extending the grid to peri-urban

areas occupied by the poor does require some capital expenditure per connection, but very much less than extending supply to new – often inaccessible - rural areas.

4.8 Improving Women's Quality of Life

The study of socio-economic impacts of rural electrification in **Mozambique** (Åkesson (1997) op. cit) concludes that benefit perceptions are highly linked to how gender roles are seen by the stakeholders.

Increasing access to energy brings disproportionate benefits for women, particularly in rural areas. This applies in the areas of health, education and productive activities, because in large parts of the world, and again in rural areas in particular, women spend more time than men cooking and collecting water and fuel. Modern energy for lighting, communication and motive power enables women to develop cottage industries that can diversify and increase their incomes, J. Saghir (2005),p.7.

A similar conclusion emerges from the social anthropology study of two **Zanzibari** villages (T. Winther (2005)) where new types of income for women is observed, and this again gives women more autonomy and moral legitimacy to decide. Among other things, it is observed that spouses now share the paying of electricity bills, whereas before electrification, the paying of bills was a male dominated activity. With more such influence of the women in the household, it is observed that household spending gradually change from consumer goods and gadgets to investing in children's development, including the emergence of both parents now having expectations for their daughters future beyond becoming wives and mothers.

Another interesting observation from this Zanzibar study is that husbands have "come home" after dark as a result of electrification, because television has changed social relations and enhanced the social position of the wife in the wider social setting. At the same time, women have taken to cooking fewer meals since the coming of electricity and television.

Data from **Nicaragua** in 1998 reported in J. Saghir (2005) and K. O'Sullivan and D.F. Barnes (2005), shows the percentage of a family's children that attend school to be highly correlated with the availability of electricity (72% versus 50% enrolment for those without electricity). Similar ratios were revealed regarding literacy percentages of rural households. However, it does not automatically follow from such correlation that electricity causes these improved social indicators. It could well be that those rural households that have had electricity installed were wealthier in the first place, and a proper statistical analysis should secure a control sample of households to be able to identify the partial effect on school enrolment and literacy caused by having electricity in the household. Such support of the hypothesis is, however, provided by an ESMAP survey of women's time use in rural India from 1996. It showed for different income levels that access to electricity was crucial for the likelihood that the women in the household would read. While unsurprisingly the survey found that wealthier women spend more time reading than poorer women, the survey clearly showed that poor women with electricity in the household read many times more than poor women without electricity at the same income level.

Women do the cooking in most households and in poor rural areas they and their siblings are excessively exposed to harmful indoor air pollution from open fires, leaking stoves and poorly ventilated dwellings. Respiratory ailments caused by such emissions is established to be the fourth leading health risk in developing countries, WHO (2002). Access to clean modern fuels

and use of pumps to access safe drinking water provide significant health benefits which again enhances their productivity at work and number of healthy days of life, as shown in the Resources for Future (RFF) overview by M. Toman and B. Jemelkova (2003) and by J. Saghir (2005).

The S. Chowdhury and M. Torero (2005) econometric study of **Bangladeshi** household data studied the impacts of infrastructure on women and their role in rural communities explicitly. Such analysis requires that one controls for the influence of other variables, e.g. women's human capital, her households financial capital, and when studying the partial effect of one kind of infrastructure to control for availability of other forms of infrastructure. The results confirm the more general findings cited earlier regarding the developmental role of electrification relative to e.g. road access and telephone access. Their study found that the incidence of off-farm employment of women is positively influenced by women's age and education, and by the availability of a public phone in the village, along with the travel time to the nearest growth centre. Whether the village has a paved road and electricity is also positive, but not significant. Hence village level infrastructure creates not only opportunities for schooling, but also non-farm employment opportunities for women. The role of electricity in this context, however, appears to be much the same as described by G. Foley (1999) above, and in the section above on complementarity between types of infrastructure being provided.

Their study of Bangladeshi villages (still controlling for the impact of income and human capital) further showed that the time women spend on unpaid work declines with access to electricity and tube wells because it reduces the time spent on household related labour. Households without a tubewell spend more on activities that require water, and the availability of electricity reduces the time spent on activities related to heating and cooking, such as collecting firewood and cow dung. Availability of such infrastructure does not, however, seem to reduce the time women spend caring for their children. At the same time, when rural women have access to all three kinds of infrastructure (road, electricity and telephone) they spend fewer hours in agricultural production and more time on entertainment. Whereas access to only road or to telephone seem to shift their time allocation between farm and non-farm activities but not reduce overall work time, access to electricity leads to reduced overall work time and more time spent on entertainment, i.e listening to radio and watching TV.

4.9 How Lack of Data Hinders Reliable Impact Analysis

4.9.1 The case of Tanzania

In 1989, Norway, Sweden and Finland jointly decided to finance the NOK 820 million Pangani Falls Redevelopment Project (PFRP) in Hale, **Tanzania**. Power production started in 1994-5. It initially contributed 17% to the national grid. This percentage had dropped to 10% by 2004. Orgut Consulting AB and WSP International were commissioned by Sida and TANESCO to carry out the post-evaluation, 10 years after it completion in 1995. The following highlights their findings regarding development effects based on an evaluation conducted 10 years after the project completion, see Orgut and WSP (2005).

The Evaluation Report concludes that the basic PFRP feasibility study of 1990 and reports prepared by Swedpower in subsequent years up to 1995 all have made good efforts – in spite of limited data availability - to analyse the available hydro-metrological data to ensure that the water balance estimates at Pangani Falls suffice the requirements.

The holistic view of different natural regimes being dependent on each other pursued in these studies, was, however, not pursued when it came to the use and management of the natural resources by the various stakeholder groups, see Orgut and WSP (2005), p.19, and socio-economic and environmental investigations stopped at the villages directly bordering PFRP and so did the plans for mitigation. Complex stakeholder conflicts over water demands proved to be the biggest threat to the power station to operate. The additional power generating capacity installed at the Pangani Falls has, in addition to water requirements for power generation, and increased demand for domestic-, irrigation-, livestock-, and industrial purposes, exacerbated the already existing conflicts over water within the basin.

A weakness of the feasibility study of 1990 was that it limited it's scope to the direct influence zone, even if it was reasonable to assume significant impacts beyond this zone. For the six villages directly affected by the construction the feasibility study offered only very general baseline data on socio-economic issues including land use. These data included identification of physically affected households and institutions (e.g. schools) and measured of remedial action for these, but no monitoring data or other information whether such measures has taken place could be found by the Orgut & WSP (2005) evaluation report (p.23).

In late 1992, mitigation and community development related issues were narrowed down to a "Programme for Up-grading Local Infrastructure and Services" (PULIS) run at the Norplan site office. The monitoring and mitigation tasks of PULIS were separated out and subcontracted to Norconsult AS. A rather casual report to this effect by Norconsult AS in 1995 was all that the evaluation could trace. Two Swedpower reviews in 1993 provide some additional community development information, whereas the 1994 EIA lacks the socio-economic chapter and has only some few scattered bits on social issues. Lack of systematic monitoring thus characterizes the progress reporting of this project, and as a result, very little in the form of substantiated outcomes on the situation of fishermen, gender issues, land use changes and predicted versus unforeseen impacts is found. Scio-economic data after the 1995 review on what happened in the direct vicinity of the hydropower plant are lacking completely, and PULIS activities are not referred to in the reports after 1997. TANESCO's PFRP monitoring programmes for 1997-8 and 1998-99 contain no evidence of systematic monitoring.

The result of such socio-economic and demographic data shortcomings is that it has become virtually impossible to reliably measure the socio-economic impacts of the projects. The few progress reports that have been produced are of a very superficial nature and void of any attempt at counterfactual analysis. Mere observation based on repeated visits during and after project implementation and interviews with long-term stakeholders in the area of influence suggests unsurprisingly that the PULIS has had poverty reducing impacts through improved educational and health facilities in the affected area. The PFRP has triggered a substantial influx of workers from non-project villages and from regions far afield. These were followed by and influx of petty traders/vendors, and medium business people who came to set up lodging, bars and eating facilities. Many prostitutes followed in this wake. These non-PFRP employees (project multiplier effect) came to tap the much increased income flowing to the influence area through the PFRP workforce. It was informally reported to the evaluation team that in Hale village alone, the population increased almost 5-6 times very suddenly.

The local communities have by and large a positive attitude to TANESCO and a good relationship to the 75 TANESCO employees and their families. The locals appreciate the TANESCO assistance for different social services, facilities and a few job opportunities which is available to them at the TANESCO compound. With the exception of provision of water facilities and sanitation, the infrastructural developments is considered a success by the evaluators. School buildings, houses and most institutions put in place during the project up until 1995 are still in place and in use. As regards water, however, most wells that were drilled are now dry, and the ventilated pit latrines are by now in shambles. Short of accurate before and after (and even more so "with" and "without") data, it is difficult to assess the social impact of the projects in terms of criminality, prostitution, etc. but the fact that the villagers report positively on the project is a good sign that the project's overall impact is positive, Orgut & WSP (2005), p.64..

Conflicts due to competing water use exceeding water supply are magnified due to wasteful use of the scarce Pangani Falls water resources. Such wasteful use is in part due to water being perceived as abundant ad free to tap among farmers being by far the largest user group (as everywhere else in Africa). such perceptions has led to choice of production of water intensive product as well as water intensive production methods. Lack of coordination among various ministries, institutions and agencies has also contributed to conflicts rather than harmonious relationships, according to the Orgut & WSP (2005) evaluation.

An important impact dimension and concern of major power project construction in Africa in recent years is the change in prevalence of HIV/AIDS and other related diseases. Reliable data on such prevalence in the direct and indirect zone of influence of the project is available since the project completion year of 1995, see Orgut and WSP (2005). p54-60. However, it is virtually impossible to measure the partial impact of this power project on HIV/AIDS prevalence. For one during the PFRP implementation period there were several other interventions in the project area such as major construction, increased through traffic of truckers serving non-PFRP demands, and continuing recruitment of workers into large-scale farm estates. Based on interviews with key informants and village group interviews, the evaluation (Orgut & WSP (2005)) concludes that it would be unrealistic to pin the prevalence of HIV/AIDS in the project area on PFRP. On the contrary, PFRP played a major role in thwarting the prevalence of the disease during the pre-1995 project implementation period through a series of active HIV/AIDS prevention and control measures.

4.9.2 Poor and misleading data can prove costly: The case of Uganda

Uganda has been a major recipient of Norwegian power sector aid in recent years. During 1997 – 2005, Norad commissioned support to 25 projects guided by 18 bilateral agreements with a total Norwegian contribution of NOK 336 million. The major share of the financial contribution has been for investments in hydropower generation and sub-station upgrading, refurbishment and extension. The support for the investment projects has been to a large extent provided in co-financing with World Bank credits for the Third and Fourth Power Projects (Power III and IV). In addition, some 10% of the financial contribution has been provided as institutional support in relation to the regulatory reform of the sector including an institutional cooperation arrangement with the Norwegian Water Resources and Energy Directorate (NVE), see J. Claussen et al (2006).

The objective of this support was to improve operational efficiency, increase generation capacity and support the reform of the sector by establishing a new legal and institutional

framework. The objectives were articulated in a Power Sector Restructuring and Privatization Strategy (PSRPS) passed by the parliament in 1999. The main objectives of this strategy was:

- √ improve the reliability and quality of electricity supply,
- √ meet the growing demands for electricity and to increase area coverage,
- √ make the power sector financially viable and efficient,
- √ attract private capital and entrepreneurs, and
- √ take advantage of export opportunities.

When assessing the ex-post situation of Norwegian support against the above targets, it is apparent that some targets have been partially met, especially related to technical losses in the transmission system. However, in contrast to the main justification for the reform and the investments that Norway supported, the situation has dramatically worsened in terms of volume and reliability of power supply, financial viability of the sector and export revenue. This crisis deterioration is caused by a combination of events, both natural (some of which should have been foreseen and to some extent guarded against), technical-, and political, including delays and uncertainties regarding large scale power project investments caused by undue interventions by international finance institutions in the negotiations, see J. Claussen et al (2006). While the above developments can not be directly attributed to the projects supported by Norway, the support was intended as a contribution to a sector development within the same policy framework. The institutional support provided was a direct contribution to a sector reform which coincided with a need for substantial state intervention and investments, contrary to the policy promoted.

J. Claussen et al (2006) conclude in their review that the project interventions were highly justified; however, questions can be raised to some of them including the approach taken. Failure to identify and lock in on a least cost and cost-efficient investment portfolio includes:

- Investing in yet another unit at Owen Falls without a more thorough initial assessment of the available water resources. Norway did raise the issue of Lake Victoria's hydrology in its project appraisal. However, there is no evidence that any action was taken, and Norway provided finance anyway.
- The relevance of the Third Power project, in terms of priorities for the sector, is debatable. The project was conceived in the early 90's, and with the required upgrading of the transmission and distribution infrastructure, the first priority should have been the least-cost option to reduce the high losses in the system. With additional investments and management support, system losses could have been further reduced resulting in a reduced capacity requirement of 50 MW. In the situation today with severe water shortage, capacity addition is not helpful, while successful loss reduction would have required far less load shedding.
- The Norwegian practice is that most of the infrastructure investments have been made by suppliers contracted through limited (and often Norwegian) competitive bidding. While there is limited evidence to suggests that this has led to higher than market prices for the supplies, in some cases and for some investments, the number of competitors have been so limited that even suppliers with a less than favourable track record in past investments have still remained as main suppliers, did not exceed reasonable price levels compared to the previous supplies of Units 11 and 12 (also national competitive bidding through parallel finance from Norway).

- The observation that the overall efficiency of the third turbine at Owen Falls, supplied by Kværner, can be questioned since expanding capacity for generation in a situation of reduced water discharge should have been reconsidered, as compared to additional investments to reduce system losses.
- The practice throughout Phase I with Addendums 1 and 2 and Phase II of entering into extensions of existing contracts with the Norwegian suppliers and the consultant could be defended as a practical solution and save mobilization costs. However, lack of competition tends to escalate costs and weaken the quality of the works. Altogether, the contracts subject to tender still comprised the major and most costly components under Phases I to III, with 56% of the amounts allocated from Norwegian funding spent on tendered contracts, while the remaining 44% were negotiated directly with the supplier.
- In those cases when contracts were tendered, it was national (Norwegian) tenders rather than international tenders. This appears to be due to the fact that many of the contracts were funded using a mix of tied and untied aid allocations. Accordingly, the total Norwegian contribution has been managed as tied aid, despite that, only approximately 30% of the funding was actually stemming from tied aid instruments (parallel finance and mixed credits)
- The observation that for the different phases of the sub-station investments it has been difficult to compare costs, since many of the contracts were subject to numerous variation orders and there were compensations paid from funds on subsequent agreements. For Phase III, tendering was reintroduced for the main contracts, only the consultancy services were for practical reasons continued as an extension of the existing contract.

The investments in sub-stations and support for Supervision Control and Data Acquisition System (SCADA) constituted the dominating part of the Norwegian investment support. With a reduced loss of more than 2,500 MWh during 2000 – 2005 the net economic gain is about USD 2.5 million per year (measured by 2005 cost levels of energy not served). With an equivalent accumulated saving over the years to come the total investment will have been recovered within a 12 year period, far les than the assumed lifetime of the investment, if it is adequately managed and maintained. These loss reducing investments thus appear to have been appropriate and well timed.

5. POWER SECTOR REFORM IMPACTS

5.1 Efficiency and Effectiveness: International Experience

During the last two decades the electric power sector has been undergoing massive restructuring worldwide. The main thrust of the restructuring drive has been to break up the traditional monolithic national or regional electricity companies and separate generation, transmission and distribution functions and introduce competition at each level. Such sector reforms have been designed to enhance efficiency and effectiveness in countries where the electricity supply systems are technically and commercially mature, and electricity demand is growing slowly, but reform advocates have assumed that the basic assumptions that make such reforms attractive are also present in poor developing countries with low degrees of electrification and high rates of rural poverty. Profitability and attractive returns to invested capital are key factors determining whether private sector operators will enter a market, and the low income rural and peri-urban markets from grid-connected power is more often than not able to satisfy these supplier conditions. What has characterized successful and effective electrification implementation organizations – whatever their detailed structure (see the listing of such alternative structures above) – is their public service ethos obliging them to extend the supply to all potential consumers in their franchise areas.

The two key market reform dimensions in the power sector are:

(i) establish an independent regulatory agency (IRA), and
(ii) provide for independent power producers (IPP).

Some countries have engaged in both reform elements, others in only one of them.

It takes time to change corporate culture and systems. Crucial to the success of such reforms is involvement of key stakeholders in the reform process and to allow whatever time is needed for reform ownership to establish before its implementation, see e.g. the Cote D'Ivoire privatization experience reviewed by Jammal and Jones (2006) for a success story, and the similar study of Senegal's privatization attempt of the electricity sector reviewed by Gøkgur and Jones (2005).

It is important to have an independent regulator in place before the commercialization of the utility is initiated so that good governance, transparency and whatever social considerations in the PRSP or other key policy documents can be properly adhered to when implementing the energy policy.

Reform experience show that with a good reform process in place, ownership (private or public) of the power producer is not decisive for outcome, but autonomy to operate on commercial terms is. However, getting active private owners "on board" can sometimes revitalize the utility and enhance efficiency beyond what a commercial public operator can achieve.

Estache (2005). P.71-78, studied such impacts for the 1990s in Africa and found as a general conclusion that all the countries who have engaged in both reforms (IRA and IPP) have done better than average, while all of the deteriorating countries where those that had implemented none of these two kinds of reforms. Among the countries that had adopted just one of the two

reforms, there was no clear answer to which of the two provided for the highest cost-effectiveness and efficiency.

Experience referred to in G. Foley's (1999) review paper and in subsequent policy reform assessments up until the present strongly suggest that before a "blueprint" of "best sector organization practice" in well-functioning developed power sector markets is approved for implementation in a poor developing country, and especially for the supply of electricity to the rural areas, a careful analysis of the market- and institutional conditions for successful transfer of such "best practice reforms" must be conducted, see ESMAP (2005).

The design of many of these power sector reforms has been based on the false perception that the private sector would resolve the rural electrification problem, but the perception that privatization would lift the burden of rural electrification from the government has not proved to be true. This disappointing experience is in line with the concerns over the scope for transferability of "global best practice reforms" designs and "blueprinting" them from well functioning market economies to poorly functioning small developing economies, as exemplified by **Uganda** and reported in M. F. Keating (2006). While private companies have been improving the reliability of electric power services, and in general have been improving the efficiency of distribution, the private sector cannot be expected to serve the poor populations in remote areas without some form of public policy support. This is the most important problem of the post-power sector reform era.

A recent positive development though is the absorption of rural energy work within the private sector, markets, finance and rural infrastructure thematic group, and that the Bank-wide Energy and Poverty Thematic Group has been revived by the Bank's Energy Sector Board. Issues of innovative financing schemes - such as output-base aid – can there be addressed in the context of developing rural markets.

The Asian Development Bank (ADB) Operations Evaluation Department (OED) has carried out several studies on improving effectiveness of its advisory technical assistance (ADTA) and project preparatory technical assistance (PPTA) in developing member countries, including **China**, Bangladesh, Nepal, Cambodia, Viet Nam, Indonesia, and the Philippines, see ADB (2001) and ADB (2006). ADTA is a modality developed to finance institution building, plan formulation and/or implementation, operation and management of projects financed by ADB. While the studies covered support for institution building more generally and not only the power sector, it is worthwhile to note the key findings, which were that ADTAs and also PPTAs:

- often did not address critical issues because they were "supply driven" by ADB
- failed to involve key decision makers in topic selection, or
- failed to design ADTAs within a strategic longer term program of support
- design, including preparation of ToR, was usually dominated by ADB, and lacked Government ownership.
- Specifically, for the power and water sector, a recent ADB evaluation (ADB 2001a) of five developing member countries found that the contribution to policy reforms was less than potential, primarily due to lack of country ownership of the ADTAs , weakness of the executing agencies, adverse domestic environments for reforms, and adopting issue-based approaches to reform instead of longer-term programmatic approaches, and ad hoc approach to training and capacity building.

Furthermore,

- Lack of country ownership was cited as one of the main factors limiting technical assistance (TA) effectiveness, and a checklist of good practices was provided for enhancing country ownership.
- Another concern emerging from these ADB reviews/evaluations was that technical assistance for capacity building and enhancing country ownership to the institution building and policy reforms was that the implementation periods should allow more time for dissemination and planning for implementation.
- By 2003 ADB required design and monitoring frameworks to be prepared for all TAs and that *the success of TAs would be measured in terms of outcomes and not outputs*

Many advisors/consultant engaged in such ADTA contracts were found to lack familiarity with the country in which to help with institution building and plan preparation and implementation. In other words, the shortcomings identified by ADB's review of its own performance is a useful reminder and baseline for assessing the effectiveness, outcome and impact of Norwegian institutional cooperation agreements, e.g. "twinning agreements" with local power sector institutions which is discussed below

5.2 Poverty and Development Impacts of Sector Reforms

The recent ESMAP assessment cited above examines power sector reforms in **Ghana, Mali, Namibia, South Africa, Tanzania and Uganda** in order to establish their impact on poor people in Africa. This is done by tracing the relationship between this process and certain key factors that directly affect the poor, such as:

- access to electricity,
- the affordability of electricity services,
- quality and reliability of supply,
- access to such social services as electrified clinics and schools,
- economic development, and
- net impacts on public finances (which can free up public funds for other purposes)

The ESMAP assessment concludes that the impacts of these reforms on the poor in Africa is difficult to quantify, in part because in most cases the reforms are not complete, or they have not been implemented as designed. The latter point is important because it resembles the situation where a patient is diagnosed with a certain disease and is prescribed antibiotic treatment. For the treatment to be effective it must be followed to the letter, if not the treatment is likely to fail. ESMAP claims that establishing poverty impact is further complicated due to the many indirect factors at play. However, attention should just as much focus on the former concern, i.e. the slow and patchy progress of reforms. ESMAP concludes that in some cases, the limited progress with reform can be attributed to unrealistic expectations or inappropriate reform design. Industry models based on experiences in larger countries with more developed infrastructure may be inappropriate in the context of many African countries, and competition may be difficult to reconcile with the desire to attract independent power producers (IPPs). Either way, most reform programs have been driven by performance and investment concerns, with the intention that this will improve the physical infrastructure in the country and thus facilitate economic growth and development. Reforms have also resulted in new special customer service arrangements such as new prepayment methods that have allowed poor people to choose and monitor how much they wish to spend

on electricity each month. Namibia's Northern Electricity has proven this to be the case and the utility has expanded electrification to new communities.

ESMAP's 2005 Africa review first focuses on access to electricity before and after reforms. The reason for this focus is simple; Access to electricity is assumed to improve poor people's livelihood and income earning opportunities, and reforms are often designed to provide improved access to electricity. Most reforms have been designed so as to improve the efficiency and financial soundness of an ailing power sector so as to attract new investors or free up government resources to be used to expanding access, provided there is effective demand. While such action has been necessary, it has often been accompanied by urging a shift towards market-driven private sector participation. This has encouraged many utilities to focus on providing electricity to predominantly non-poor communities that are already proven to be profitable and can be connected at low cost, and not to extend the network to poor areas with inadequate affordability and demand at prevailing connection fee and tariff structures.

Where expansion of the network into poor communities has taken place, it is more often a result of complementary poverty reduction government policies – not necessarily coordinated with the parallel sector reform process - that have been implemented in parallel to the sector reforms, as has been the case in e.g. **Ghana, South Africa and Tanzania**, where the first two have achieved much higher than average electrification coverage than the rest of Sub- Saharan Africa.

Recent studies of donor driven technical assistance in relation to electricity sector reform in **Uganda** illustrates with clarity the difficulties encountered when attempting to "blueprint" rich country "best sector organization practice" onto poor developing countries with vastly different market, institutional and cultural settings. Reform design failure becomes a tempting conclusion[15].

A recent review of the power sector reforms in **Kenya** and **Uganda** has focused specifically on the extent to which the amendment of the Electricity Act in these two countries have influenced electrification of the poor[16]. Virtually the entire rural population in these two countries fall under the USD 2 per capita per day poverty line, and only 1% of the rural households has access to electricity. The study concludes first that the amended electricity acts do not sufficiently address the issue of the electrification of the poor. Secondly, the utilities, Ministries of Energy, and regulatory agencies make no attempt to track electrification of the poor. Thirdly, the sequence of power sector reform measures appear to have been detrimental to electrification of the poor. Fourthly, the reforms also appear to have failed to link rural electrification to the overall strategy of improving the performance of the electricity industry, and lastly, current rural electrification targets are very low and would within the next decade, leave well over 80% of the rural population with no electrification even if the set targets are realized. In the case of Kenya, the rate of rural electrification declined during the reform period. Electrification has been outpaced by the population growth rate. Effectively, the power sector reform do not appear to have an impact on electrification levels. In the case of Uganda, virtually no rural households have access to electricity (according to scanty data on rural electrification). The stagnant electrification levels for the poor imply that they have

[15] M. F. Keating (2006), "*Global best practice(s) and electricity sector reform in Uganda".* CSGR Working Paper No 192/06, Department of Politics and International Studies, University of Warwick, UK,
[16] S. Karekezi and J. Kimani (2004), "*Have power sector reforms increased access to electricity among the poor in East Africa?"* Energy for Sustainable Development, Vol. VIII No. 4, December 2004.

been left out as far as access to electricity is concerned. Also here overall electrification of the poor has not kept pace with population growth. In the case of Uganda, however, post reform regulatory and policy instruments have been put in place to provide incentives for rapid rural electrification. Baseline data and a monitoring mechanism should be put in place to follow the actual development.

According to ESMAP (2004a) p. 67, the key challenge of power sector reform in Central America is how to provide electricity to the primarily rural poor households that do not have access to the service. However, while prices for existing customers tend to be low and many of these have benefited from the investments being made in the existing distribution systems, there has been little expansion of service to new customers in rural areas in the four countries studies (**Guatemala, El Salvador, Nicaragua and Panama**).

The WBG (2003) evaluation report, p. 39, sums up its findings by stating that the little evidence available indicates that the poor are often the last to benefit from increased access under the PSDE reforms. They tend to be overlooked because private operators are reluctant to serve low-income clients given that these markets are not financially viable on a free-standing basis. When reforms involve adjusting tariffs upwards to cover costs, poor households (both urban and rural) tend to be adversely affected, at least in the short run. In many cases where the Government has tried to compensate for such actions by introducing social tariffs to shield consumers from the cost escalating effects of the PSDE reform, such tariffs have been designed in such ways that they do not reach the poor, and access to modern utility services remains highly inequitable, e.g. as observed in **Guatemala** where Foster and Araujo (2004) finds that the social tariff policy designed to shield electricity consumers from the 60 – 80% real tariff increase following the power sector reform indeed has succeeded in keeping charges at pre-reform levels of USD 0.08 per kWh for up to 300kWh per month. This implies a subsidy of USD 0.03 – 0.07 per kWh when compared to the full cost electricity tariff of USD 0.11 – 0.15 per kWh. However, their detailed household survey-based study of incidence of benefits of this social tariff policy, which requires a budget transfer of USD 50 million in support of the utility supplier, does little to help poor households. There are two reasons why this is so. First, 60% of poor households are not connected to the electricity network at all. Tariff subsidies is of no help so long as they are not provided connection opportunities at affordable prices. Second, those poor households that are already connected consume less than 50 kWh per month, and even average income households consume no more than 130 kWh per month. Their detailed findings suggest that as a result of this social tariff policy, poor connected households only capture 10% of the overall USD 50 million annual tariff subsidy. At the same time, poor households not connected pay the equivalent of about USD 11 per kWh – equivalent to 80 times the subsidized electricity tariff – to light their homes with candles and wick lamps.

Foster and Araujo (2004) thus concludes that the USD 50 million annual subsidy could be redesigned to have a much more social profile if the bulk of it were to be spent on expanding the network to poor households at affordable connection fees. In fact most of the subsidy could be freed up for alternative uses with a a reduction in the social tariff ceiling corresponding to the monthly consumption level of poor or lower middle income households, e.g. around 50 kWh per month. With an estimated connection cost of USD 1000 per household, 50,000 new households could be connected per year for that amount, and such a policy would be very effective at reaching the poor.

In spite of the lack of effectiveness in reaching poor households after the power sector reform introduced along with the Peace Accord in 1996, one must nevertheless admire Guatemala's electrification achievements in the post-reform period. Funds committed to electrification in the post-reform period have been spent as promised, and coverage has improved significantly compared to e.g. African countries. Foster and Aruajo (2004), p.21 found that at the national level - all types of households, irrespective of location, poverty or ethnicity – experienced a statistically significant increase in the probability of being connected, and traditionally disadvantaged groups gained disproportionately. Their household survey data showed a pro-poor outcome in the sense that the post-reform probability of being connected increased 90% compared to the pre-reform probability for the non-poor, by 115% for the poor, and 183% for the very poor. Because of the big gaps between the very poor and the non-poor, such increased probabilities cannot compensate for the much lower initial probability of being connected for the poor and very poor. Even after such large increases in probabilities of being connected, the extreme poor still only have a 0.17 probability of being connect, compared to 0.28 probability for the poor, and 0.55 probability for the non-poor. It should be noted, however, that the observed impressive increase in new connections in rural areas the post-reform period in part is due to the initially high coverage in urban and peri-urban areas, and this has facilitated more effective use of the rural electrification fund.

The WBG (2003) evaluation further reports (p.40) that while indeed it can be argued that economic growth resulting from addressing the generation supply constraint is good for the poor when analyzed in a macroeconomic context of market liberalization and transition towards a market economy, the argument is less tenable in the sectoral context of scant - if any - private capital flows into the power sector of poor countries. This has resulted in a relative neglect of the issues of ensuring that the poor can get help to afford commercial power tariffs once subsidies on generation plants are removed and of ensuring that regulatory reforms are not so "hard wired" that it is difficult to simultaneously implement social and environmental objectives.

WBG (2003) concludes that despite publishing best practice papers on energy efficiency and rural energy in 1993 and 1996, respectively, the Bank has made little effort to pursue these areas in its 1990s portfolio or in its energy portfolio as a whole. There was little institutional drive and lack of a coherent Bank strategy for rural energy and energy efficiency for most of the 1990s. From the 154 projects reviewed, there is little evidence of a concerted Bank effort to reform regulatory frameworks such that local private capital and management capabilities can be tapped for investments in decentralized energy systems. Both formal and informal economic sector work on rural energy and energy efficiency issues has been insufficient. The relatively few power projects that materialized with a focus on poverty reduction and a social profile were mainly at the behest of the championing individual task managers, often buoyed by the availability of Global Environment Facility (GEF) funds.

5.3 Impacts of Reforms on Access and Quality of Service

The impacts of power sector reforms on the poor in Africa is difficult to quantify, in part because in most cases the reforms are not complete, or they have not been implemented as designed. Limited progress with reform can in several cases be attributed to unrealistic expectations or inappropriate reform design.

For those African countries with information available, it was found that access rates to electricity have increased almost twice as fast for countries that adopted one or both reforms

as compared to those countries that had not adopted any of these reforms, and countries that adopted both reforms experienced that fastest access rate improvement.

With regard to quality of service, the findings from Africa have been somewhat different due to a third politics-related variable at play. It was found that performance improvement has been more closely correlated to ending of a conflict than to adoption of one or both of the above reform measures. However, one should read such conclusions with caution because one of the results of a reform is stronger incentive to identify faults and have them repaired in order to be able to increase collection on bills. The independent regulator would be better inclined to do this that a public utility section.

Estache (2005) examined quality of service change for 48 countries during the 1990-2000 period and found that adoption of an IRA improved significantly the quality of service as measured by reduced transmission and distribution losses. While no statistically significant impact on access rates from IRA alone was detected in that study, joint adoption of IRA and PPP improved access rates significantly.

5.4 Impacts of Reforms Across Income Groups

Two DHS surveys for 17 African countries provide data for two points in time that give a very rough picture for comparing network electricity access rates across income quintiles. Except for the lowest income classes (the first quintile, which had zero average access rate both prior to reforms in 1990 and also afterwards around the turn of the Millennium) matters have improved for the other four income groups, with the largest percentage gain for the middle income group (the third quintile). The second quintile (next poorest group) had access rate increased from 1% to 4% over this decade, while the middle income group had its access rate increased from 4% to 12%. For the next highest income quintile it increased from 22% to 32% and for the highest quintile from 68% to 75%. The latter two groups are predominantly urban.

The next question is: How much can the described reforms be credited/blamed for the access changes across income groups? The study of 17 African countries found that having both IPP and IRA tends to favour the middle income class, while the poorest and richest are better of in countries where the government have adopted only one of the two reforms. Countries which have adopted no such reform are associated essentially with no impact at all on the bottom 60% of the population, while most of the increased access accrues to the richest 20%.

5.5 Nordic Institutional Support - Who Benefits from ”Twinning”?

Unlike the international institutional reform support reviewed in Section 5.1 above, the Norwegian institutional support to the power sector has been mostly focused on establishing institutional cooperation between Norwegian- and local public institutions, and in that context assisting in setting up new bodies such as regulatory agencies and the changes in legislation and regulations to go with such institutional sector reforms. Modernization of the overall economy and providing long-term assistance to the power sector to facilitate such modernization processes and industrialization have been at the core of the Norwegian assistance, while explicit poverty reduction has not been in so much in focus. Unlike many of the international studies that have focused on quantifying impacts and effectiveness of institutional reforms, such “with-without” or “before vs after” documentation has in most of the Norwegian institution building and power project development assistance not been on the agenda.

Experts with extensive involvement in such Norwegian aid confirm to this report that when assessing the utility or value of such projects and institutional cooperation, the focus has been on the value of increased power sales (both old and new customers), and of reduced outages, transmission and distribution losses. In some cases one has conducted random interviews among stakeholder to assess the possible role of the programme in facilitating and encouraging establishment of new industries and economic activities, but baselines have either not been established at all, or the baseline information has been limited to direct effects often measured in the form of inputs rather than outcomes. Indirect- or multiplier effects of the investment/technical assistance in institution building is hardly ever attempted estimated. Furthermore, systematic collection of socio-economic data for control areas/situations as a basis for counterfactual analysis of the impact and effectiveness of the cooperation has not at all been the rule. Without such counterfactuals and baselines, there has not been much focus on monitoring during and after completion. As a result, there is rather limited quantitative evidence available for assessing effectiveness, efficiency and impact of the Norwegian support in this field, and thus little evidence from Norwegian aid to this sector to draw on as lessons for future such collaboration. The following assessment must be viewed in such a light.

Institutions have been increasingly seen as a key factor in the development process, and Institutional development has been an important element in Norwegian development aid since the early 1990s (Christain Michelsen Institute (CMI) 1998) with Norad's "Strategy for the 1990s" and White Paper No 51 (1991-92) and No. 19 (1995-96). According to J. Teigland (2006), 17.4% (NOK 432 million inflation adjusted to 2004 prices) of the Norwegian power sector aid during 1999-2004 was categorized in DAC sub-sector 10: "Energy Policy and administrative planning". In line with this, Norwegian institutions have been given a central role as partners in development with the introduction of the "Norway Axis". The policy has been for Norad to be responsible for funding and coordination of projects, with the cooperating institutions in the South and Norway being responsible for planning, implementation and reporting. Such cooperation – for short often referred to as "twinning" – is seen to provide the recipient with a broad range of competence and services through "sister" institutions with a comparable mandate.

However, the 1998 cross-sectoral evaluation of such "twinning" experience carried out by CMI 1998) concluded that the experience from this kind of aid arrangements is not solely positive. The most common criticism include:

- Supply-driven nature of institutional reforms
- Resistance to change of status quo in many Southern institutions
- The cultural and communications barriers between foreign advisors and consultants on the one hand, and local management and staff, on the other.

Such "twinning" arrangements have played a key role in Norwegian aid in the energy sector at large and in the electricity sector. Key findings from reviews of a selection of such contracts are presented in the following.

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Norway has provided assistance to the **Namibia**n Energy Sector since 1991 in the form of bilateral 3-year agreements with focus on institutional strengthening. This cooperation was reviewed in 1998 with emphasis on the institutional cooperation between on the one hand the Norwegian Water and Energy Administration (NVE) and the Norwegian Petroleum

Directorate (NPD), and their respective counterparts in the Ministry of Mines and Energy (MME), see Scanteam International AS et al (1998).

While the review concludes that while institutional strengthening undoubtedly has taken place through the activities that have been implemented, such strengthening could have been approached in a more structured and comprehensive way. The review finds that the reporting and monitoring of the Bilateral Agreements' institutional strengthening objective has not been properly observed by any of the two Agreement partners. In fact, the review finds it virtually impossible to carry out a proper review due to the lack of performance indicators and indicator data that could document to what extent the agreed deliverables had been delivered and the "twinning" arrangement had produced what was intended by the Agreements. Of real concern was the observation that there were at the time (after three consecutive Bilateral Agreements had been completed) no definite plans in place with verifiable indicators available on which an assessment could be made. As a result, one would only be able to speculate on the resulting strengthening effects on the recipient institutions after nine years of such a "twinning" operation.

One may argue that NVE has observed the principle of recipient responsibility within the framework of the programme by passively responding to the demands for services presented by their counterpart on a rather ad hoc basis and not related to any human capacity building or training programme. That the recipient declared extreme satisfaction with the way the Norwegian assistance was administered is no documented indication that it has contributed to capacity building or paved the way for economic development and poverty reduction in a cost-effective manner. The satisfaction is more likely to reflect the fact that the Norwegian grant funds have been provided as budget support, whereby the MME is made financially accountable but otherwise have had complete freedom to plan and implement without interference from the Norwegian side.

Norway has a long and extensive history of institutional development cooperation in the power sector with **Mozambique**. It started with a "twinning" agreement between NVE and EDM in 1980 to strengthen the organizational setup and administrative capacities of EDM, see Completion Document (2003). An agreement between NVE and Norad gave Norad the right to draw upon NVE expertise to meet EDM demands. This agreement was signed for an initial four years and the renewed twice until 1990, based around a permanent NVE liaison engineer position at EDM plus short-term visits by NVE personnel to Mozambique and EDM staff visits to Norway. In 1990 it became clear that the system of a liaison engineer from NVE no longer worked satisfactorily. By then some NOK 32 million had been spent under the agreement and several achievements have been listed in the review of the this cooperation agreement, carried out by the University of Trondheim in 1990. However, by 1990 this position had become a gap-filler at EDM's disposal and this did not represent effective and efficient use of the knowledge base provided under the agreement. Besides, NVE hade undergone many organizational changes and was no longer considered an optimal counterpart for EDM. The cooperation with NVE was therefore discontinued.

For the 1993-96 period, Norway provided institutional electricity sub-sector support totalling NOK 32.4 million by means of five recruited consultants placed in different parts of EDM with a focus on institutional and competence development and training focussed on the non-technical and management training. Norad in 1992 financed a South African supplied management information system that failed to materialize due to a non-performing supplier

and lack of progress reporting from EDM which jointly severely delayed the process of developing routines and control measures.

In the 1996-2000 period, EDM was transferred to become a commercial operation, and part of the Norad support was the financing of a new General Ledger system, Agresso, which was successfully implemented in 1997. Furthermore, Norad financed a co-operation between EDM and Norconsult AS for various efficiency-enhancing consulting services from 1993 to 1997 to facilitate institutional development in EDM. Following this, Norad allocated NOK 16.7 million over the 1998-2000 transition period to assist EDM in generating sufficient income.

The financial Norad assistance has since 1996 gradually been directed towards strengthening the institutional capacity of the National Directorate of Energy (NDE) which was established in 1996 to gradually take over some of the planning tasks from EDM.

Reporting and information on progress and problems, as well financial statements, from EDM to Norad were unsatisfactory during this "twinning" agreement period. Although Norad on several occasions stressed that fulfilment of reporting requirements was a basic condition for further cooperation, no direct sanctions were applied. Had Norad been sufficiently informed about the unsuccessful installation of the Management Information System from 1992 and onwards, Norad believes that one would have been in a much better position to act upon this.

Mozambique's Technical Unit for Implementation of Hydropower Projects (UTIP) was established by Government Decree in late 1996 as the planning agency for the development of hydropower potential of the water resources of the Zambesi River Basin. Norway and the Government of Mozambique entered into an agreement in 1999 for the 1999-2002 period with a NOK 20 million budget regarding institutional support to establish UTIP as an effective such institution, initially proposed by means of financing (NOK 8 million) a core consultant (selected to be Norconsult AS), and NOK 6 million for UTIP. The final agreement included an additional NOK 6 million for a large panel of international experts which Norad had not seen as necessary for inclusion in the original proposed programme, but which was included in the final agreement based on recipient demand.

Swedish institutional support to EDM was initially allocated for 2002-2004, and then extended for four years for the 2003-2006 period with SwedPower winning the SEK 20 million extension contract to supply experts on full- and part-time basis to advise the Network Engineering Department and the Corporate Planning Department of EDM five key areas.

According to Scanteam's review (Scanteam (2005 December)) indicators that were formulated to measure and monitor progress in terms of output achievements were not very useful and it is unclear if coaching, on-the-job training and knowledge transfer were included as topics to be covered. Scanteam's review concluded that this institutional support is "doing the things right" but not necessarily "the right things". More specifically, and as an example, while EDM could benefit significantly from advisory services and assistance in the areas of distribution, network rehabilitation, deficient metering facilities, non-technical losses including fraud, and fragile commercial viability, Sweden instead provided massive support to enable EDM to make USD 2 million through Southern Africa Power Pool (SAPP) related activities, while alternatively Swedish aid could have enabled EDM to make an additional USD 15-20 million by curbing non-technical losses and getting the metering problems and billing issues in order. It is a concern that even though total losses in the EDM system appear

to increase again, the issue is not at the top of the management's agenda. Other examples related to "doing the right things" have to do with what should the Swedish advisors actually do to be of best value to EDM? Scanteam (2005 December) concludes that, p. 25, "*the impression is that the chosen priorities have more to do with what is convenient for everyone rather than the real needs of EDM"* .

Along the same lines as in some reviews of Norwegian long-term institutional power sector aid, Scanteam questions - on the basis of efficiency concerns – the use of permanent resident advisers (high costs) versus visiting short-term advisors (more cost-efficient). No alternative to the chosen resident adviser concept has been presented and the tasks to be performed have not been sufficiently clearly described. Consequently, it is difficult to compare it to any alternative solution. Resident advisers are most likely less efficient, but more convenient and perhaps more effective than another solution, especially when considering the home office costs of searching for and mobilizing a range of experienced and highly qualified short-term advisors to be available at specific times. A general danger with a resident advisor position is that it becomes convenient to stay on instead of working towards making oneself redundant.

Regardless of these concerns, Scanteam concludes that it appears that long-term assistance to EDM through Swedish advisers has had a marked impact on EDM strategy and operation, and enabled EDM to improve a number of functions and methods. However, at the same time Scanteam says that no indicators have been prepared to measure progress and steer the project. Not having a monitoring framework and indicators constitutes a missed opportunity for an ongoing constructive dialogue between the advisers and EDM management. The Swedish institutional support should have its defined place and role in a transparent EDM strategy where it should be clarified how progress and ultimate achievement are to be monitored and measured. Among others, some of the advisers have been "misused" to carry out tasks without the involvement of a counterpart, and as a result the purpose of transferring know how through on the job training has been missed.

The Scanteam review concludes, contrary to what SwedPower argues, that EDM sustainability is threatened in several areas (e.g. legal services, system planning and operations) by continued permanent advisers from Sweden. In these areas EDM need to take action and responsibility itself. There should definitely be an exit strategy in place for long-term advisers. Their role is to make themselves redundant. Without a resident adviser more responsibility will be on local personnel, and this will ultimately enhance sustainability. The only area where Scanteam foresees a future role for long-term permanent Swedish adviser presence is in the core business of EDM, i.e. the commercial department, where the bulk of its income is earned. It is here that huge efficiency gains and large increased profits are conceivable with improved metering equipment and billing system, reduced levels of losses, and optimised administrative processes.

ECON (2001) reviewed this institutional support in 2001 and concluded that the basic concept of UTIP is good and that the main hydropower project that UTIP were to focus on – Mphanda Nkuwa (MN) – has great potential. The review further concluded that after some weaknesses due to internal UTIP problems during the first 18 months of program operation, the core consultant (Norconsult AS) has performed satisfactory and provided value added services to UTIP. However, the review concludes that NOK 6 million allocated for establishing and using a Panel of experts to carry out independent monitoring was not cost efficient, since the review also concludes that no doubt Norconsult itself could have taken on these responsibilities and carried them out in a more cost efficient manner. The review also concluded that the public

hearings process had been thoroughly carried out and produced relevant and well documented information for the planning process.

Based on the review's recommendation to continue to support UTIP, a "bridging finance" addendum to this agreement was signed in 2003, covering a programme period for 2002-2005 with a NOK 8.9 million budget and the original objective retained, but made clear the need for clarifying UTIP's future role, which had been envisioned to be expanded to cover the whole country and include also mini-hydropower stations. Such expanded mandate did, however, not materialise.

A new review was undertaken (Scanteam (August 2005)) which concluded that one could not separate UTIP's 2003-2005 activities from what went on before that time, and that UTIP as an institution had continued to develop positively in accordance with its mandate facilitated by means of the institutional support provided. With a good organisational structure and functioning administrative and accounting routines, it had been able to do good promotional activities and had much better and wider professional capacity than from the outset.

However, in the mean time, the assumption that eager investors were waiting for completion of the MN feasibility study completion to mobilize finance and start construction of the hydropower plant, proved totally wrong. The anticipated strong investor interest did not materialise. As a result of UTIP expanding its capacity and scope while its original mandate faded away, UTIP ended up taking on activities not within its mandate, nor proposed to be within a changed mandate. The original mandate was simply not valid any more, but no initiative was taken to change the mandate or redefine the role and responsibilities of UTIP. Taking on transmission line studies was considered by EDM to stepping onto the EDM turf. As a result, the Scanteam review of 2005 concludes that UTIP's effectiveness has been elusive, and efficiency has been hampered by lack of funding for local personnel and the lack of development of the MN project. It would be premature to conclude that UTIP has established institutional sustainability. While the quality of assistance provided by Norconsult AS is judged to be both satisfactory and relevant, and the MN feasibility study of excellent quality, the expectations regarding the ultimate achievement of success have repeatedly been overstated thus reflecting unrealistic and unfounded expectations. This has led to several extensions of the project time-wise, and a NOK 8.9 million "bridging" phase, neither of which deserves the ratings effective and efficient. In conclusion the Scanteam review of 2005 states that "*further support to UTIP is not any longer likely to make a difference to the further fate of Mphanda Nkuwa.*" UTIP seems to be redundant without a new mandate.

Norway has also provided institutional support to Mozambique's National Energy Directorate (DNE) in the form of a cooperation agreement ("twinning arrangement") between DNE and NVE, the latter providing a resident long-term advisor and short-term advisors as needed, as has been the practice in previous "twinning" arrangements involving NVE and its developing country counterpart in a number of Norwegian developing partner countries. It is up to NVE to propose external consultants for specific tasks, and DNE may accept or reject such proposals. Such twinning arrangements between institutions that carry out more or less similar functions in their respective countries are assumed to have comparative advantages over alternative institutional support arrangements, due to the ability to draw on a pool of experienced experts with relevant specific skills and sometimes previous institutional power sector experience from the country in question..

The first such agreement with DNE in Mozambique was signed in March 1998 and later extended through three added addenda, the latest in mid-2002 with expected completion originally in 2005, but extended to 2006, and a NOK 20 million budget, see Scanteam (2005 August). The objective is that DNE performs as a credible power sector authority.

Scanteam (2005 August) concludes that such a "twinning" arrangement in this particular case from the outset may suffer efficiency and effectiveness losses because:

- the functions of DNE are broader than those of NVE. As a result, the advantages of twinning have limitations,
- there are limitations in the relevance of experience from elsewhere to the situation in Mozambique,
- the scope of actually finding and making available the most experienced advisor for a specific task is very narrow, and
- twinning lacks a competitive element. It precludes tendering to obtain best possible services at competitive costs. Competitive bidding for the provision of the required services is recommended because it is likely to provide the best available solution compared to the choice of NVE based simply on previous practice.

Furthermore, Scanteam (2005 August) reports from this "twinning" arrangement are not of consistent information quality and that has limited the validity of their assessment to some extent. Goals and objectives were not formulated in verifiable terms and therefore, project management could not be entirely sure to be on track. Scanteam (2005 August) concludes that the project design logic is deficient and does not offer a good management tool. As a result, reporting is sub-optimal, and it appears that management is ad hoc and intuitive, rather than systematic. Against these data deficiencies, the following somewhat vague efficiency conclusions emerge:

- A resident advisor is an expensive solution and is not efficient in terms of use of financial resources, since resident advisors throughout the project period have not been responsible for specific outputs requiring specific skills. The contribution of this position and the associated NOK 4.3 million to enhanced competence and effectiveness of the DNE cannot be established with available data.
- Setting up a local area network with Norwegian expertise and training of Mozambique personnel in Norway is clearly not cost-efficient.
- NVE's short-term advisors and work performed by consultants under specific contracts have been used for well defined tasks contributing to concrete outputs. As a result one may assume that such aid is efficient.

Effectiveness in general, on the other hand, is judged rather favourably by Scanteam (2005 August). Much progress has been made in the areas of regulation, concessions and agreements, and DNE has presented itself with confidence as a credible power sector authority, and has listed achievements in the area in detail. Eventually, procurement effectiveness and more effective administrative routines have also been established. However, in the field of energy planning effectiveness appears not to have been achieved and other donors would appear to have the competitive edge, e.g. Danida. As regards policy advice on the other hand, Norwegian advisors may be well placed to contribute to the process.

Norwegian support to the electricity sub-sector in **Uganda** during 1997 – 2005 amounted to NOK 336 million. The major share of the financial contribution has been for investments in

hydropower generation and sub-station upgrading, refurbishment and extension. In addition, some 10% of the financial contribution has been provided as institutional support in relation to the regulatory reform of the sector including an institutional cooperation ("twinning") arrangement with NVE.

J. Claussen et al (2006) conclude in their review that this institutional arrangement with NVE served to support:

- some key processes like developing a new Act and new regulations with assistance of NVE personnel,
- assistance in procurement of Norwegian consultants to support the process,
- consultants to assist in developing a tariff model,
- assisting the GoU in the process of negotiating transactions related to commercially operated power generation (IPP) and distribution schemes
- enabling national institutions access to Norwegian funding for study tours, and
- supporting initial operational costs and was also critical in financing the initial investment and operational costs of Electricity Regulatory Agency (ERA)
- establishing ERA as an institution with the capacity to sustain its operations and undertake its mandate. The cooperation with NVE has gradually been phased out and even sourcing of external technical assistance taken over by ERA itself. This may serve as an indicator of project outcomes being sustained.

However, J. Claussen et al (2006) p. 62 also observed that:

- the institutional arrangement with NVE continued beyond the required timeframe, apparently driven more by a desire to maintain the arrangement than actual need for assistance. This is evident by the fact that the arrangement is formally still in operation despite no requests for assistance from ERA.
- some of the assistance provided had limited impact and only limited visible outcome could be identified from NVE's long- and short-term advisors, as well as from numerous "coordination" visits beyond the NVE legal advisors inputs to the process of elaborating the Act and the regulations.
- the institutional support also provided financial resources for numerous study tours for national stakeholders enabling them to be exposed to different legal environments relevant in implementing the reform process in Uganda. Questions can, however, be raised in terms of numbers of participants and choice of some of countries with regulatory environments different from the planned reform in Uganda.
- questions can be raised as to the continued use of substantial resources for study tours and operational costs.
- the assistance provided for institutional support has effectively been managed as tied aid, with no competition for the main service provider (NVE). Additional consultancies from other suppliers have been subject to limited national bidding in Norway and/or have been directly contracted..
- when comparing actual costs of inputs (approximately NOK 16.5 million worth of inputs from NVE and Norwegian consulting companies) with the main tangible outputs such as support to the process of developing a legal framework, tariff model and transaction advice, it compares unfavourably with a process of tendering services with clearly defined tasks. This is further confirmed by the fact that 26% of these

costs were charged to coordination, management and short term visits with limited direct contribution to MEMD and ERA.

- financially, however, ERA is at risk, given the fact that it has continued to utilise project funding also to cover regular operational cost and use the "savings" on own revenue to further increase its salary levels far beyond regular levels of comparable public institutions,
- some of the outcomes from consulting services appear also to need continued consultancy support, in particular in maintaining and further developing the tariff formula if and when the private sector responds to the opportunities created by the new regulatory environment.

Palestine has been another key recipient of Norwegian institutional water sector aid since 1993, see J. Claussen et al (1997), J. Claussen (1998) and J.Claussen et al (2001). Palestine authorities requested a consultant study for establishing a national water authority, and Norad approved of NOK 3 million funding for this in 1994. By means of open tender the consultant was selected. However, in 1995, the Palestinian authorities approved the establishment of of a Palestinian Water Authority (PWA), and then reversed their decision and instead requested direct support to having the PWA established. Based on advise from Norad and a Norad-financed consultant, they instead decided to establish a "twinning" arrangement with NVE in collaboration with NIVA and SFT for the creation and development of PWA in 1995. A project document was prepared by the Norad funded consultant in late 1995 and forwarded to Norad for assessment, but no such independent review of this NOK 32 million proposal was conducted. The agreement was signed in early 1996 within a budget frame of NOK 31 million. NOK 14 million of this was spent on the "twinning" agreement between PWA and NVE, NOK 3.2 million between PWA and CESAR for developing legislation and regulations for the water sector, NOK 3.9 million between PWA and Norconsult International to develop a water tariff system, and NOK 3.3 million between PWA and Deloitte & Touch, Norway, for follow up of the contract to establish a regional water utility in Gaza. The rest has been used by PWA for purchase of local consultant services and for operating expenses.

PWA has been responsible for implementing the project. During this period it's staff expanded to 65 employees, almost all of them aid-financed. The project coordinator in Norway and Palestine have consistently pushed for activities they have viewed as crucial for developing PWA to become an operational institution. Aside from the coordinator, most of the technical assistance has been provided by short-term (1-2 weeks) visits by various experts from the member institutions of the "twinning" agreement.

However, PWA became increasingly frustrated with continuously having to deal with new such experts – many of them judged by PWA to have questionable relevant experience, limited language[17]- and pedagogical skills. In the end PWA attempted to take over command of the process, and the cooperation between PWA and the Norwegian coordinator grew very tense, requiring a complete review of the entire "twinning" arrangement.

Due to Norad's strong participation in introducing NVE in that key role, led PWA to perceive the Norwegian funding as aid tied to the participation of NVE and their associates in the "Twinning" team. In fact, the project agreement document states as a condition that PWA establishes a "twinning" agreement with NVE for the implementation of the project. As a

[17] Among other, an assessment report following a review of PWA's financial system was submitted by the norwegian NVE consultant in Norwegian language!

result, PWA has been led to believe that their search for expertise is tied to those approved by NVE.

As reported in the Norad completion Report, see J. Claussen (1998) p.6, much of the problems and tensions are due to the fact that PWA was non-existing when the project started and the people appointed to establish the PWA had no such institution-building experience. Norad did not have sufficient capacity to follow up requests for technical assistance to this effect from PWA. PWA never succeeded in establishing a satisfactory economic reporting and monitoring system., and such systems have also been unsatisfactory in the "twinning" arrangement between PWA and NVE. NVE-incurred expenses and hours have not been registered per activity. NVE did not have its own project monitoring system because as a state enterprise it had not been set up to carry out projects as part of its ordinary activity. As a result, PWA and Norad have not been able to assess effectiveness/productivity in the implementation of the technical assistance provided by the Norwegian institutions.

The Completion Report further states that the agreed audit- and accounting reports do not provide sufficient basis for assessing whether the audited invoices are for activities in accordance with the agreement.

The Completion Report therefore provides the following recommendations for the design of future "twinning" agreements:

- "Twinning" agreements shall only be entered into and approved in cases where the institutions actually exist and are operational. In the Palestine case, PWA was for all practical purposes hardly established when the agreement was signed.
- Even if a "twinning" agreement is established, a competent project leadership is a basic requirement for governing and monitoring the inputs and activities under the agreement, especially those under the "twinning" partner with the main responsibility (in this case PWA).
- One may question the setting where Norwegian public administrative bodies which themselves are dependent on hiring expert services for development of administration and leadership constitute the best choice of consultants for offering the services of establishing new public institutions in developing countries. Most likely, public administrative bodies and research institutions have more to offer in the form of services to the cooperating local institution.

In this particular case one should also draw experience from the following factors that most likely have contributed to the described outcome:

- PWA and the NVE "consortium" represent very different institutional cultures,
- PWA was to be developed to address the issues related to management of scarce water resources to be allocated for water consumptive purposes, while the Norwegian NVE first and foremost manages (for the most part) abundant water resources for hydropower uses (NIVA of course was a "twinning" agreement partner with water resources expertise more in line with PWA needs)
- PWA was to be set up to deal with chronic water scarcity whereas a key Norwegian water management challenge is to prevent and deal with spring floods,.
- In Palestine and Israel, water resources constitute crucial political and strategic resources where data secrecy and bargaining for water use rights is a crucial agenda item. In Norway this is virtually an unknown issue.

- When establishing "twinning" arrangement between institutions from such extremely different backgrounds it becomes crucial to select advisors from the delivering institution that have extensive experience from setting similar to that of the receiving institution.

In conclusion, a common denominator from the review of these "twinning" arrangements involving NVE has been the identification of a systematic lack of a set of indicators (both covering organizational efficiency and institutional legitimacy) for monitoring and evaluation of institutional development projects. Such inputs to monitoring and evaluation is needed for securing the fulfilment of Norwegian aid principles (gender, poverty and environment) and for securing cost-efficient and effective use of the resources provided through such cooperation arrangements. The institutional "twinning" arrangement involving NVE and Norwegian institutions have been too much supply driven with too little monitoring of quality- and relevance control. Monitoring mechanisms must be developed and put in place for Norad to take action and correct development directions that could lead the project astray. Open tender for provision of institutional cooperation would also contribute towards more cost efficient and effective provision of "twinning" arrangements with more sustainable outcomes.

5.6 Rural Impacts of Institutional Power Sector Cooperation

5.6.1 Grid-based rural electrification impacts

Large-scale grid-based rural electrification is a relatively complex business and institutional issues and constraints must therefore be given explicit attention from the beginning of the planning process. An effective implementing agency is one of its most basic requirements. ESMAP (2005a) has found in their review of rural electrification success stories worldwide that the exact institutional structure does not appear to be critical, as they found that a variety of approaches have been successful. They include:

- A separate rural electrification authority (Bangladesh)
- Setting up rural electric cooperatives (Costa Rica)
- Allocating rural electrification to a department of the national distribution company (Thailand)
- Delegating rural electrification responsibility to the regional offices of the utility (Tunisia)
- Outsourcing rural electrification to the private sector (Chile).

The following (unsurprising) common factors are shared between those institutional models that have worked well:

- A high degree of operational autonomy, in which the implementing agency can pursue rural electrification as its primary objective without being subject to political string pulling (such pressure is often exercised when public funds are used, and can be very damaging)
- Adherence to specific project selection criteria and multi-year electrification expansion plans
- Strict responsibility and accountability for meeting its own set targets, including cost recovery

- Dynamic leadership and a strong management group, shielded from the political process and pressures (yielding to such pressures can destroy professional discipline and undermines organizational structure, and lowers staff morale and operational effectiveness)
- Staff incentives, security and clear career prospects,

Most utilities, when the time comes to tackle rural electrification on a large scale, find it best to hive this off from their mainstream activities into a separate implementing agency. This needs autonomy and authority, a clear mandate and a secure budget that meets its investment and operating targets, to carry out its task successfully, see e.g. ESMAP (2004a). The simplest such institutional arrangement is to create a rural electrification department within the utility. Another alternative – which has been implemented in **Thailand** with success – is to establish a separate agency which is responsible for the implementation and subsequent running of rural electrification programmes. A third approach – originally developed in **USA** – is the establishment of rural electric cooperatives as the implementing and operating agencies of their rural electrification programmes. This arrangement is presumably best suited in relatively homogenous social milieus without major ethnic or social differences. Experience from a.o. the **Philippines** suggests that the cooperative approach can provide an effective institutional model if the above described institutional and operational conditions are met. At the same time, deciding on a mechanism for community participation should be an early priority task in planning a rural electrification programme to avoid sabotage and lack of cooperation from key local stakeholders. A local electrification committee could be one such mechanism.

ESMAP (2004a) reports that most governments of **Central America** have set up a subsidy fund for rural electrification as part of the reform process. However, these subsidy funds have either not been capitalised properly, or appropriate institutions, responsible for administering integrated programmes based on clearly defined rules, have not been established. According to ESMAP, the only such fund which is operational is in **Guatemala**. As a result, expected government contributions either have not been made, or the funds themselves have not disbursed grant money as required. This is not, however, a criticism of the idea of creating such subsidy funds. Such funds - when operational - should be open to both existing and new distribution companies and any new service provider, private or NGO-related, that want to serve new consumers and can demonstrate that they have the ability to manage a rural electric power service. Such funds should also be open to both grid and off-grid options.

5.6.2 Off-grid electrification impacts

When it comes to institutional development designed to facilitate off-grid options, the joint Danish/Norwegian experience with Solar Home Systems (SHS) and Micro Hydro (MH) installations in rural Nepal discussed in Section 4.2.2 below appears to be a "best practice" case worth considering for wider dissemination. Another interesting such case is the **Bangladesh** Solar Home Program based on facilitating credit sales in rural unelectrified areas, see C. Ratnayake (2005). This is part of a larger rural electrification program supported by the IDA Credit for the "Rural Electrification and Renewable Energy Development" (RERED) project effective since 2003. This SHS project based on a 'pay-for-service' arrangement operated by the rural cooperatives. The project is managed and administered by the Bangladesh Infrastructure Development Company (IDCOL), and is based on credit sales of SHS by selected POs who will receive the GEF financed grant as well as loans to support their own credit facility provided to customers. Eligible POs can be any registered entity (private business, NGO/MFI or other community organisation).

The arrangement is that the POs have to purchase their requirements of PV panels, batteries and other components directly from vendors and set up their own terms of purchase and payments. In general many vendors have been eager to cooperate with the POs and offer delayed payment terms to facilitate higher volume of sales. The POs also have to make arrangements for regular after-sales service and to ensure that any customer complaints are dealt with expeditiously. Sales of SHS systems are financed by customer's initial contribution (about 15%), a GEF grant and the credit purchase loan of which 80% is refinanced by IDCOL. In addition, IDCOL expends funds from the GEF grant (mainly in the initial months) for publicity, training and other programme support extended to POs. IDCOLs loans to POs and program supervision costs are expended from the IDA Credit.

C. Ratnayake (2005) reports that a key feature of the programme and reason for its success is the active and hands-on involvement of the project entity in facilitating and development of the programme. Instead of establishing the operating guidelines and then taking a passive role while relying on private entities to carry out the marketing and consumer awareness initiatives, the programme relied on IDCOL to carry out these initial activities as well as in assisting POs acquire the necessary skills for this new venture. In particular, while the NGO/MFI activity was well developed in rural Bangladesh and already have the confidence of the rural population and will be able to function as an efficient and trusted source of SHS delivery, and in addition had a collection history strong enough to develop a credit line, these entities had little or no knowledge of the technical or business activities of a SHS program. IDCOL is also supported by a technical group which handles certification of equipment that will be eligible to be used in the programme. This group also assists when technical issues such as equipment malfunction arise. The battery suppliers have arranged for the buy back of unserviceable batteries at a prearranged price and for their environmentally safe disposal.

C. Ratnayake (2005) reports that the success of the programme has been phenomenal. The first 14 months of the program saw 20,000 systems being sold and currently at the end of the second year the total sales stand at 32,332[18]. The challenge faced and successfully dealt with was to ensure that the NGOs can gain proficiency in SHS systems, their dealings with equipment suppliers and customers during after sales support. The programme shows that this can be done with careful planning and adequate support in the initial stages.

Another important lesson noted by C. Ratnayake (2005) which applies universally across countries is that initial assistance in establishing a market for SHS systems is important. This is needed both for the new vendors with no previous experience on the subject as well as for developing the confidence of consumers on a high priced and relatively unknown product. New markets need to be primed by appropriate assistance and redressing bottlenecks as they arise and not only by setting the overall guidelines and rules of play. It is expected that with these key barriers broken down the SHS market will thrive in unelectrified areas.

5.6.3 Nordic support for off-grid electrification

The successful case of Nepal. In Nepal, Denmark and Norway have supported the Government in the rural energy sector, primarily through the Energy Sector Assistance Programme (ESAP) under the management of the Alternative Energy Promotion Centre (AEPC), see Danida/Norad (2006). AEPC is an autonomous governmental institution under

[18] The severe floods experienced in August 2004 resulted in some fall in sales but the program is back on track with installations at the rate of about 1,800 systems per month.

the Ministry of Environment Science and Technology (MOEST). It was established in November 1996 for the development and promotion of renewable and alternative energy technologies in Nepal. The Micro Hydro (MH) component of the funded has serviced 25,299 households (equivalent to approximately 150 000 people) in rural communities in 36 of Nepal's 75 districts. The districts and communities serviced are found to have a higher share of its population living below the national poverty line. A recent survey of the poverty impact of rural energy projects concludes unsurprisingly that distribution of MH generated electricity show a positive correlation with income level (the more well off have a higher share of MH consumption than the poorer segments). However, the survey does not examine the beneficiaries at household level but rather the distribution at district[19].

The survey finds that the major use of electricity is related to consumption rather than productive use. In line with other international studies reviewed above, it also finds that while availability and affordability of electricity may create a condition of improved income; it is rarely the binding constraint for increased income generating activity leading to overall increase in consumption and welfare in a community. Provision of MH electricity has furthermore led to substitution of other sources of energy consumption like kerosene lamps harmful to health. It has also enabled access to other services like radio which serve to inform and educate on a range of important issues to the poor like health, and it has enabled communication (through telephone). It has improved the learning environment and extended the length and number of classes in schools (95% of the respondents in a survey reported improved educational performance of their children due to MH). The latter alone represent significant direct and indirect long term benefits for the society. Thus there are direct benefits as well as positive externalities which can be associated with the MH investments.

Also in line with findings from a range of international studies, the Nepal study finds that the user willingness to pay for the services indicate a net benefit to the community in economic terms, **even though in the areas with MH, the economic activity and investment in income generating activities has only marginally improved.** Given the political situation, which have had an adverse impact on development in the general environment of any income generating activity, this may serve to confirm observations from various studies that one type of infrastructure investment alone will not contribute to significant growth in income. Income generating activities depend on a range of factors. It includes investments in other infrastructure, access to relevant financial services and other services required to develop an enterprise.

The Danida/Norad (2006) ESAP/AECP survey of the poverty impact of rural energy projects in Nepal concludes that distribution of Solar Home Systems (SHS) has most likely serviced poorer household to a lesser extent than MH. It will have the same impact at the household level as MH although less potential for serving commercial activity requiring power for other uses than lighting and low voltage appliances. Solar systems, however, is the only viable alternative to electricity in some locations (no potential for other MH or other technologies especially the mountain areas). To increase cost-efficiency of this technology it requires a significant further up-scaling of the market in Nepal and/or increased competitiveness.

In conclusion, this component has contributed significantly in meeting the national and sector targets for Nepal. It has more than achieved programme targets. While the longer term impact of the component cannot yet be determined, however there is evidence to suggest a positive

[19] "Understanding Rural Energy Programme and Poverty Reduction Linkage – An Empirical Study of Nepal", G.Nepal and V.B.Amatya, MOEST/AEPC 2005.

correlation between access to MH and social welfare at the household level. Studies conducted reveal the MH component influence investment in districts and villages with lower income levels than the "national poverty line.

In the case of **Mozambique**, which has been a major recipient of Nordic power sector aid both for infrastructure development and institution reforms, a recent Scanteam review (Scanteam (2005 February)) concludes along similar lines as the Keating (2006) review rural electrification impacts of institutional reform in Uganda. Mozambique has undertaken a restructuring of the energy sector to create a more modern management of its resources, including:

- Having in place a fairly modern power sector legislative framework
- Transformation of the national power utility into a state company
- A regulator has in principle been created
- A national fund is in place for the promotion of rural energy
- Links to the Southern Africa Power Pool (SAPP) have been established.

While these changes are in line with new public management theories and what is considered "good practice" structures for mature energy markets, a growing concern is that "*it may be that the relatively large number of new entities may fragment the very limited skills base the country has*", (Scanteam (2005 February), p.1).

However, the contribution of the energy sector to poverty is still unclear. Modern power sector legislation is in place, but implementation and enforcement appear to lag far behind. As has been documented in Chapter 3 and 4 above, electrification is an important contributor to economic development in the long-term, but for one it is a necessary but not sufficient condition for this to happen. Secondly, the analysis in Chapter 4 also shows that in the short to medium-term electrification will have little impact on either the energy consumption nor income generation of poor households. Good tracking of development and distributional impacts is rarely provided for in electrification studies (se Chapter 4.9 above) and better indicators reflecting poor households actual energy demand and ability and willingness to pay for access and consumption is needed so that power policies can be designed more carefully. Better indicators can enhance performance tracking and the conceptual basis for more relevant pro-poor energy interventions need improvement. This conclusion applies regionally, and not just to Mozambique.

As has been the case in **Uganda** (see Keating (2006) above) , the restructuring being initially proposed for EDM was built on recent "good practice" models from mature energy markets and not from relevant emerging market experiences. In addition, the proposed restructuring also did not take into account the many regulatory failures that have occurred even in highly developed markets. The present EDM restructuring approach is much more cautious and includes intensified study of potential impacts and provides for cross-subsidization between high-income and low-income consumer groups as a means to finance electrification of poor areas. Even so, the current focus on power is clearly not attacking the root concerns of the poor, and this makes it difficult to justify the size and structure of donor subsidies. At present, therefore, poverty relevance should not be used as a justification for the electrification programs and sector reforms.

5.7 Impact of Reforms on Public Finances

5.7.1 International experience

ESMAP (2005) points out that reducing the sector's dependence on public finances has been a key driver of reforms. Higher tariffs have the potential to create revenue that utilities can use to develop and expand electricity networks that would benefit the poor, if this is what they prioritise. In Ghana and Namibia, for example, educational and health institutions have been among the first to be connected, and some communities have even ridden on the back of these facilities to obtain access for the whole village. Furthermore, some social gains in the form of "fiscal space" for social spending in health or education, for example, might have occurred, but ESMAP finds it difficult to pinpoint such fungibility outcomes, and concludes that the success of separating the sector from dependence on public finance has been limited. In several cases, special tax deals have limited tax receipts, and where profits are made, these often have to be retained in the business rather than paid as dividends to the government shareholder.

However, if bankruptcy is the alternative, it should be easy to understand that a bankrupt utility is in no position to invest in expansion of electricity services to poor people. Tariff reform, provided it is combined with efficient management, is often essential to restore the financial health of utilities. ESMAP (2005) notes that in Namibia, Northern Electricity demonstrated that improved billing and reduction of technical and non-technical losses allowed this private utility to actually reduce tariffs. More generally, however, its review finds that the impacts of IPPs operating under take-or-pay PPAs is still difficult to evaluate with certainty. Altogether, it is not demonstrated that power generation under IPPs is cheaper than under alternative arrangements.

The WBG (2003) review of private participation in the electricity sector (PSDE) found that macro-fiscal balancing was a key objective in the Bank's PSDE program during the 1990s. This was in response to the global financial crises that further aggravated the inability of most developing countries to mobilize resources to meet their own power supply shortages.

Successful PSDE was found to eventually bring many fiscal gains. In Latin America the substantial fiscal gains from public divestiture added private investments in the power sector, raised income taxes, provided dividends to governments and reduced subsidies. The review points to results such as increased foreign investments , improvements in coverage, quality and productivity in **Bolivia**, significantly reduced non-technical losses in **Chile** (50% in seven years) and **Argentina** (50% in three years). Improved fiscal performance has facilitated investments so that access to electricity has increased; e.g. in Panama (where also consumer prices have dropped), and in Chile where the percentage of households with electricity grew from 64% in 1990 to 95% in 1994, and in Bolivia, where it had dropped to 56% before the power sector reform and increased to 70% in 1997 after the reform.

As pointed out in the ESMAP review above, reforms in many countries have helped governments save heavy operating subsidies by getting in place private operators. Where private operators have taken over retail supply, they have drastically reduced payment delays, theft, and unpaid bills /from 30% to 12% in Buenos Aires, and about the same in **Cote d'Ivoire** before the civil war broke out. Over a 5-year period plant availability increased 10%, the number of customers per employee increased 50%, outage indicators decreased by more than half, and e.g. in Chile and Argentina where competitive pools were set up, bulk prices for power dropped 20% to 50% as a result of efficiency gains being ultimately passed on to

power purchasers. However, while all consumers have benefited to some extent from lower prices, the greatest benefits have gone to shareholders and to richer consumers.

5.7.2 The Norwegian aid cooperation experience

The Norad financed electrification of the rural areas in the former Owambo region in Northern **Namibia** which started in 1991 was reviewed after completion in 1995 (M. Davies and S. Nghikembua (1995)). The review found that the high extension charge on the lines of the publicly owned utility responsible for generation, transmission and some distribution (mostly to commercial farmers), meant that small settlements would never be able to cover the costs of supplying them. Since the Ministry of Regional and Local Government and Housing (MRLGH) is responsible for paying these bills, such losses must be covered by revenue from sales to higher income (and consuming) areas, and second, the Government of Namibia can directly contribute to the cost of supply in these low income rural regions through the annual budgetary allocations to the MRLGH. In case of transferring the responsibility for this regional supply to a private enterprise, there will be a pressure to raise the tariffs unless the Government increases its contribution towards the costs. To retain a social profile in the provision of grid power under such socio-economic dispersed conditions definitely implies significant pressure on public finances.

5.8 Role of Governance, Transparency and Investment Climate

5.8.1 The international experience

According to Transparency International (TI) the public works and power sectors are internationally perceived to be the most corrupt and third most corrupt industrial sectors worldwide. A World Bank note on public policy for the private sector provides supporting assessment when it says that "*the energy sector, with its complex mix of public and private actors and often enshrined central monopoly power, is prone to corruption"*. Corruption is clearly fostered by the lack of transparency and accountability which besets private power projects and their PPAs in particular in developing countries. Many examples suggest a clear link between the lack of due process, corruption, and the development of unwarranted, often uneconomic private power projects.

The history of power sector projects reveals a clear trend of hydrologists' projections of hydropower production being overoptimistic, see J. Claussen et al (2006), p.8. Hydrologists are aware that their clients and hydropower contractors prefer larger projects, which again mean bigger contracts for project-related goods and services, and more opportunities for patronage and corruption.

The same optimism is frequently found in power demand projections. In more than 100 national electricity demand forecasts used by the World Bank, actual demand seven years after the forecasts were made was on the average 20% lower than projected. The PPA for the **Ugandan** Bujagali project for the 2000-2020 period is based on power demand projected to grow by an average of 8.3% annually. In 1998 a study by Electricite de France projected Ugandan power demand to grow by an average of 5.5%. In its report on the Bujagali project, the World Bank Inspection Panel criticized that several assumptions used in the demand forecast were "not properly justified" or "should have been more thoroughly explored".

A recent World Bank study, A. Escribano and J. L. Guasch (2005), has developed a methodology and estimated the productivity impact of variables characterizing a country's

investment climate on productivity using firm level data from **Guatemala, Honduras and Nicaragua.** They show that it is possible to get robust results for 10 different productivity measures, if one follows a consistent econometric methodology of specification and estimation. The study found that a number of variables in several categories, but red tape and infrastructure in particular, appear to account for over 30% of productivity. This led them to conclude that investment climate matters enormously, and the relative impact of the various investment climate variables indicates where reform efforts should be directed. Among their key findings, the following dimensions related to red tape, corruption and crime are of relevance to this State of the Art report and the subsequent full evaluation:

- If plants dedicate one more day to inspection and regulation control activities, the productivity will decrease between 5.8% and 10.7%. This is most relevant for old firms,
- A one percent increase in the fraction of undeclared sales to the IRS will decrease productivity between 0.42% and 0.77%.This impact is especially importnt for small plants,
- For every new criminal attempt suffered by the firm, the productivity is reduced between 1.8% and 3.2%.This is most relevant in old and large firms.
- Those firms that win competitive advantage by making payments of 1% of the sales to "speed up" bureaucratic processes will have an increase in productivity ranging from 1.3 to 3.3%. This shows that there is room for improvement in the administrative procedures followed in the three countries, so that no more arbitrary administrative gains in productivity arises from bribes of firms.

Regarding infrastructure, their analysis concludes as follows:

- A 1% increase in the average duration (hours per day) of power outages, decreases productivity between 0.02 and 0.1%, depending on the productivity measure used. It mainly affects old plants.
- A 1% increase in the average number of days to clear customs will decrease productivity by 0.1%. This specially affects young and small plants,
- A 1% increase in the fraction of shipment losses will decrease productivity between 1.23- and 2.53 %. This is most important for old and small firms,
- Firms with access to internet are between 11 and 15% more productive than those firms without it. This impact is especially relevant in old firms.

In addition, it is worth noting that firm productivity is strongly enhanced when firms are:

- Engaged in a process of ISO quality certification,
- Engaged in training programs for the workers in addition to on the job training,
- Becoming publicly listed and incorporated,
- Engaging in an external audit of its financial statement

The recent detailed econometric study of before and after infrastructure reform impacts on the poor in **Guatemala** (Foster and Araujo (2004) p. 42) also looked at households running their own enterprises. They looked explicitly at micro-enterprise impacts in the form of productivity and profits. They found that micro-enterprise households covered by modern utilities have significantly more profitable enterprises, and in the case of electricity they found that profitability more that doubled. Furthermore, within communities that have access to

services, enterprises that take up connections to electricity and telecommunications services are significantly and substantially more profitable than those that do not. For rural areas they found that micro-enterprises with electricity have profits that are 65% higher on average than micro-enterprises without electricity.

Recent international investment climate assessments (ICAs) covering African countries are still very few. For the six African countries so far posted on the web with such information (Eritrea, Ethiopia, Kenya, Mozambique, Tanzania, and Uganda) electricity appears in the top five among 19 possible constraints listed. When asked which factors are major or severe obstacles for the operation and growth of their business, 48% of the surveyed establishments listed electricity. (40% of these also listed corruption as a major or severe obstacle).

Estache (2005) p 81, in a survey of 48 countries covering the 1990-2000 period studied the impact of electricity reforms on access and quality of service and found that corruption reduced the effectiveness of IRA in improving quality, and that corruption on its own reduced access rates in electricity, independently of the existence of an IRA or PPP.

Estache (2005) p. 31 also presents survey results complementary to those presented above showing that a significant number of establishments in African countries have invested in own sources of power supply (e.g. diesel generators for back up) even if they are supplied by the public grid. Having invested in such backup adds to the costs of operation because outages and the risks associated with outages makes export oriented enterprises particularly vulnerable and the expected sales losses due to such unreliable power supplies can often be the factor that tips an investing decision to a more reliable location. Reliable power supply is thus an important investor attractor and through that growth enhancing and poverty reducing factor. This effect is particularly strong as regards foreign investors, since domestic enterprises more often supply local markets and are thus less exposed to international competitors.

5.8.2 The Norwegian aid cooperation experience

In a recent review of barriers to power sector investments in developing countries, based on data from a World Bank survey of the 65 largest power sector investors in emerging markets in 2002, B. Brandzæg and S.Hansen (2006) found that the most significant barriers in developing countries are a weak legal protection of investment followed by the absence of multilateral guarantees and weak consumer payment discipline.

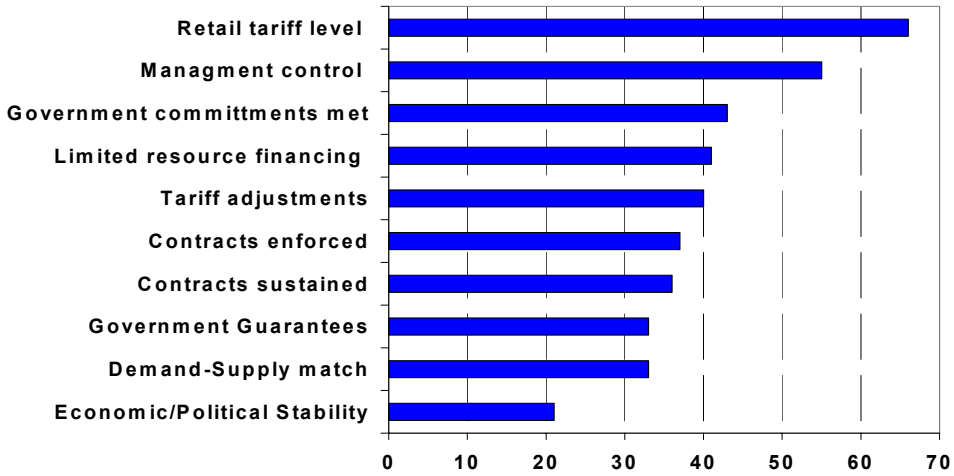
Power sector investments in developing countries tend to succeed when:

1) The retail tariff level is set at a level that guarantees an acceptable return on investment,
2) The investor is allowed to retain management control over the company invested in, and
3) When the government and the regulator follows through with its commitments by sustaining and enforcing contractual agreements.

A number of risk mitigation instruments exist to guarantee the investor against political, regulatory, commercial and environmental risk. But GIEK, the Norwegian institution set up to provide risk insurance products to private investors, is currently unable to extend any further guarantees to low income developing countries as their guarantee instrument worth approximately NOK 1,3 billion, is fully committed. This is a significant barrier to further Norwegian power sector investments in the least developed countries.

Norwegian power sector investors are not well informed about the risk mitigation instruments available. This may contribute to the lack of interest in investing in the power sector in developing countries.

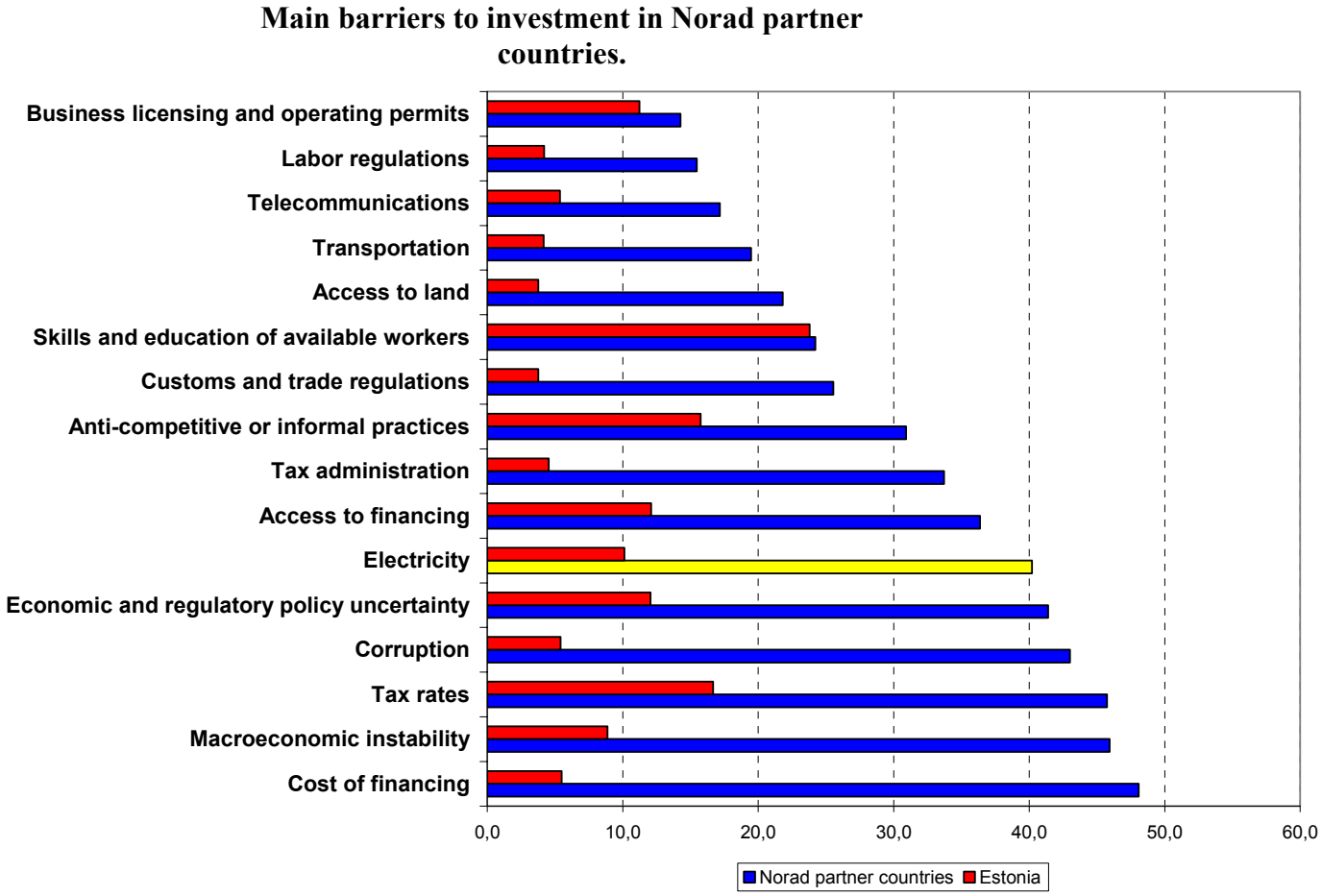
Critical factors for success of a power sector investment in developing countries in %



Source: B. Brandzæg and S. Hansen (2006), op.cit, based on primary data from a World Bank survey of the 65 largest power sector investors in emerging markets in 2002. by Lamech, R. and K. Saeed.

The above World Bank findings are quite consistent with the findings in the B. Brandzæg and S. Hansen (2006) review. The figure below shows that the low quality of electricity services is considered one of the most critical barriers to investment in Norway's main partner countries nd that there is considerable potential for improvement if the situation in Estonia is used a baseline.

As found repeatedly in the international review above, the post-completion review in 1995 of the Norad funded electrification of the rural areas in the former Owambo region in Northern **Namibia,** which started in 1991 (M. Davies and S. Nghikembua (1995)), also found that very few income generating productive enterprises were encountered as a result of the electrification programme. While having an opportunity to create new small businesses which use electricity, there are a number of other obstacles (see the figures above) unrelated to electricity supply – whether grid- og diesel based - that need to be overcome before such investments take place, and contribute significantly to growth and development.



Source: B. Brandzæg and S. Hansen (2006), op.cit. based on the survey of private power investors in developing countries undertaken by the World Bank in 2002, the Investment climate Surveys: *http://rru.worldbank.org/InvestmentClimate/*, and the World Bank survey by G. P. Gupta (2002)

It has been cited earlier in this report that the tendering processes appeared not fully transparent and the decision related to awarding the contract not always easily understood in the power sector cooperation contracts. Prices of the tenders were very close, but quality differences were identified. In the case of Norwegian cooperation with **Uganda** during the last few years, one contract was even awarded to the contractor whose previous work had been assessed as of inferior quality, see J. Claussen et al (2006), p. 63. There is no evidence therefore, that the highest value for money was achieved.

In those Ugandan cases when contracts were tendered, it was national (Norwegian) tenders rather than international tenders. This appears to be due to the fact that many of the contracts were funded using a mix of tied and untied aid allocations. Accordingly, the total Norwegian contribution has been managed as tied aid, despite that, only approximately 30% of the funding was actually stemming from tied aid instruments (parallel finance and mixed credits).

5.9 Risks Facing the Developing Country

Some important risks inherent to power projects are – at least to some extent - beyond the control of the Government, and clearly beyond the control of the power utility and the private investors. These risks include a deterioration of the exchange rate, insufficient demand for power, and insufficient water flows to generate the projected amounts of power. Private investors will normally refuse to assume such risks, and the off-takers, typically government

utilities, will be forced to carry them under the terms of a PPA as the case is in **Uganda**, see J. Claussen et al (2006).

Hydropower PPAs typically set a minimum amount of electricity for which the off-taker will guarantee to pay. If a drought means that the plant cannot generate this agreed amount, the off-taker will still have to pay. In this sense, the government does not contract to buy electricity under the PPA, but to pay for the provision of power plant capacity. The accompanying risk the government then takes is that part of the capacity is useless, a situation which is currently prevailing in Uganda.

New power plants are usually built to serve growing demand. Since electricity cannot be stored (other than in the case of dams, storing water) the electricity generated by a new plant cannot be absorbed if demand growth does not catch up with demand growth expectations and the design capacity based on these. Under most PPAs, it is the governments that have to cover this risk. So-called ”take-or-pay” clauses stipulate that governments have to pay for a pre-determined quantity of electricity, even if demand for this amount does not exist.

A large part of the cost of hydropower projects accrues in foreign currencies and foreign investors expect the government to make the payments under the PPA in foreign currency, to cover the respective exchange rate risks, and to allow for them to expatriate their profits in foreign currency. Yet the power generated by the project will be sold in local currency unless it is exported. Practice in recent years has been that governments in poor and risk-prone countries know that they will only receive support from the IFIs if they open up their power sectors to IPPs. Precisely because these are risk exposed and power starved markets the foreign power sector investors will expect a high returns on their equity investments and at the same time be in a strong contract negotiating position compared to that of the country’s government. Experiencing their negotiating position as captivity, such governments have been known to yield and offer extremely lucrative terms to IPPs, including tax holidays and guaranteed returns on investment. Such deals have then set standards that investors expect to be replicated in subsequent projects even if the governance situation is markedly improved and investor risks reduced.

It is important, however, to note that public power projects are often no more rational, transparent and accountable than private projects. The risks related to hydrology and demand are independent of whether the project is public or private. In the case of private projects, however, governments have to add a hefty return on investment to the power bill without being able to offload any major risks to the investors in return. Such additional costs to the government accrue as a result of PPAs where the Government is contracted to pay for supplied capacity rather than power delivered. Foreign investors also have a much shorter time perspective in terms of required payback period than a government would, and they also tend to rely much more on foreign consultants and imported equipment than state utilities when they develop a project. such differences in sum result in less contribution to capacity building in the host country’s power sector when a private foreign investor is in charge.

6. TRAINING AND CAPACITY BUILDING

6.1 Training as an Integral Part of Institution Support

Training and capacity building has been an integral part – sometimes clearly defined and described, at other times rather ad hoc – in most power sector institutional cooperation agreements between Norway and a recipient country, and it has constituted a significant share of overall sector support (see chapter 2 above). However, when power sector aid is distributed among DAC subsectors according the new DAC classification system that was introduced in 1999, category 81 "energy education and training" and category 82 "energy research" show up as only 1.3% (NOK 33.286 million) and 0.2% (NOK 5.983 inflation adjusted) of overall Norwegian power sector aid for the 1999-2004 period (for which comparable data are available). The training and education provided as an integral part of institutional cooperation ("twinning") agreements is registered under DAC sub sector No. 10 "Energy policy and administrative planning", which constituted 17.4% (NOK 431.688 million inflation adjusted) of overall power sector aid (NOK 2,487.664 million inflation adjusted) during that recent five year period, see J.Teigland (2006).

According to the joint Norwegian/Danish AECP/ESAP institution building programme for facilitation off-grid rural electrification in **Nepal**, the integrated training related to provision and installation of Solar Electric Home Systems has shown impressive results: 745 Level I Solar Electric Technicians have received training from ESAP and approximately 600 of them are still employed by the solar companies. In addition 125 Solar Electric Technicians are trained for Level II with 34 able to pass skill testing and get certified.

6.2 Hands on Assessment of Training Needs

An example of a pragmatic hands-on Norwegian funded initiative *to establish local training needs* in the context of a water resources management plan and update of the power system master plan, is the training needs assessment based on a questionnaire survey carried out by Norconsult AS in **Bhutan** in 2002, see Norconsult (2002). A key input to the preparation of the training plan and its implementation was a detailed questionnaire distributed to all Division and Unit Heads targeting Department of Power (DoP) employees with a specialist function or with the responsibility to lead others. The returned questionnaires were used in the assessment of the training needs and as a basis for designing a detailed training programme with components adjusted to the level of competence needed by the different groups of employees and the managers' priorities. The needs of the employees will vary from the most basic hands-on computer training to the more advanced knowledge of the different professions involved or software to be used for example for the Water Resource Management/Power planning professionals and DoP specialists..

The assessment was done in close co-operation with the departments involved and the Human Resources staff to find out the need for specialised training and needs caused by this and other project, for modernisation of Water Resource Management/Hydro-Power planning, the new Ministry, Bhutan Power Corporation (BPC) and DoP's administration. The programmes was tailored to meet the specific needs within Water Resource Management/DoP.

The survey established a strong need and more emphasise on professions like lawyers; to assist the regulator with establishing a legal framework, laws and regulations. The BPC will need legal assistance for building their business framework and organisation and for clarifying matters on electricity connecting, metering, meter reading, tariffs, cash collections and disconnections.

Furthermore, the survey established that DoP is already too much engineering-driven as pr today. The sector needs new different professionals to be able to make a successful turn-around to a commercial company. This includes professional purchasers and staff specialised in handling the tendering procedure, specialists on contracts for deliveries and construction works, and professionals in dealing with private contractors and developers.

Finally, in order to successfully implement the sector reform transition, the assessment established a need for professional Human Resources Developers to establish a more transparent evaluation system and job descriptions. In order to perform better for BPC it is necessary to be independent from the Royal Civil Service Board, recruitment and staff development has to be handled in a more professional way than today. There will also be a need for development of an incentive scheme and a better salary system.

Three recently evaluated energy research-, training- and education activities are briefly reviewed in the following.

6.3 Project-related Training and Technology Transfer

Virtually all Norwegian-funded investment projects in the power sector – power plants, transmission- and distribution systems – have a training component included as an integral part of the project. The dominant part of such training is on-the-job training (including at the manufacturers premises in e.g. Europe), and in addition comes lectures, instructions, and seminars, as well as exams as quality assurance. Such training is seen as a necessary input to secure a safe and effective transfer of the know-how needed for the local personnel to be capable to operate and maintain the power plant and/or transmission system without the need for external technical assistance.

In the case of **Tanzania**, such training as described above was an integral part of the Kihansi Hydropower project beginning in the mid-1990s and going on until recently, see TANESCO (2004) p.12-13. The training and technology transfer component of the contract was affected by attachment of 30 engineers and technicians of TANESCO personnel to the consultant and contractors, with a dominance (85%) of on-the-job training. In this project – and similarly in many other such projects – the following working knowledge was to be transferred to the local trainees with individual limited and focused topics for each trainee tailored to the job description, background and education of each one:

- Tender document preparation
- Construction methods, safety regulations, quality control
- Installation, testing and operation of electromechanical equipment
- Survey and transmission line construction
- All aspects of operations maintenance, hydrological analysis and optimization of reservoirs and plants.

- Progress reporting, coordination of contract packages, follow-up of contractual matters.

As reported in the Implementation Completion Report of 2004, see TANESCO (2004), p. 13, at the end of the training program, the selected TANESCO personnel are capable of operating and maintaining the Kihansi hydropower plant without the need for external technical assistance.

Similarly, and also in **Tanzania**, as part of the Pangani Falls Redevelopment Project started up in 1989 with funding from Finland, Norway and Sweden, a very extensive technology transfer and training programme was implemented with many different components similar to in the Kihansi project (see above), see the Main Post Evaluation Report (Orgut and WSP (2005), p.45-46.). The Post Evaluation report of this project as well as interviewed participants conclude that this extensive training and technology transfer programme has been satisfactory and very successful. However, due to rapid changes of technology ans as a result a constant need for refresher courses and replacement of experts and technicians, TANESCO also needs to have in place a training policy and also succession plans. Discussions between the evaluators and TANESCO established the following matters of concern:

- TANESCO's draft training policy discourages self-progress and limits long-term training by the company
- TANESCO is listed as not allowed to employ new staff, and
- Staff trained for specific functions and areas, do not normally retain their positions for long. Thus the aim of training is sometimes disrupted.

There is thus a need for reconsidering these conditions/constraints on cost-effective training and technology transfer provision.

6.4 The Norad Fellowship Programme

First of all, the Norad Fellowship Programme (NFP) which was established 40 years ago, has provided fellowships in Norway to several thousand students from developing countries. As early as 1977, NFP provided for 126 fellows distributed among 7 courses at 5 Norwegian institutions. Among these NTH (now NTNU) was the only academic institution, and of the 126 fellows, 24 attended the electrical power civil engineering studies and 19 the similar hydropower studies. In other words, power sector studies had a dominant role in the NFP already 30 years ago.

The NFP was evaluated by Nordic Consulting Group AS for Norad in 2004/5 (S. Hansen et al (Norad Evaluation Report 1/2005)). Tanzania has received more such fellowships than any other partner developing country (103 of the 849 total between 1998 and 2004), and was therefore one of the countries visited as part of the evaluation. Both former students and employers were interviewed as regards value and impact of the NFP. The NTNU (formerly NTH) hydropower course has produced more than 40 diploma and MSc degree holders from Tanzania over a period of 15 years, and this has clearly been critical to the country's development of supply and distribution of electric power. With an estimated cost per graduate of inflation adjusted NOK 0.5 million (assumes two years of study for an MSc degree) this means a total of NOK 20 million for this output over a 15 year period. Those who graduated from NTNU have experienced a benign career development and have reached key positions in the power sector. They report that continued close relations to NTNU and the network with

the private- and public Norwegian power sector environment has been of significant value to the development of the sector – both institutionally and technically – in Tanzania. They seek out manuals and practice notes on different aspects of hydropower, e.g. hydrology, geotechnical sciences, construction methods, mini-hydropower, etc. NTNU has done a commendable job of distributing the 17 volume series on Norwegian hydropower practice published between 1990 and 2000 to the fellows who studied at NTNU. At the same time, an alumni is likely to be established among Tanzanians who have studied in Norway. If implemented, this would further enhance the network of Tanzanian graduates and link up new graduates with old ones for the mutual benefit and synergy of information exchange in the power sector field.

A similar positive synergetic experience is reported from Nepal, another country with abundant hydropower resources and where Norwegian power sector expertise has a long tradition in technology transfer as well as institutional cooperation. Nepal is the third country in terms of NFP fellows during the 1998-2004 period, many of which have studied hydropower. An active alumni of Norwegian graduates already exists in Nepal.

6.5 Establishing Hydro Lab Pvt. Ltd in Nepal

An important outcome of the long-standing power sector cooperation between NTNU and Nepal is the establishment in 1999 of the Hydro Lab (P) Ltd at the Tribhuvan University in Kathmandu designed to carry out laboratory model studies to provide:

- means for determining the optimum design of hydraulic structures;
- facilities and opportunities for training in applied hydraulics for hydraulic design and experimental research;
- possibilities for hydrodynamic experimental research on problems that cannot be solved through theoretical or numerical analysis;
- visualization of hydraulic projects to management, decision-makers and those concerned.

Hydro Lab is established with a well equipped sediment laboratory set up to carry out:

- hydraulic model studies;
- advisory services on planning and design of hydraulic structures, most commonly in combination with hydraulic model studies;
- performance testing of hydraulic structures;
- applied research focusing on sediment handling techniques in steep, sediment carrying rivers;
- sediment monitoring activities, field studies and laboratory analysis;
- flow measurements, and calibration of discharge measurement boxes.

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Norad commissioned an independent review of Hydro Lab in 2003 (S. Hansen (2003)) which, in spite of some start up difficulties and delays, concluded favourably as follows:

- In terms of the *quality and value of laboratory work* delivered regarding design impacts from sedimentation studies and studies of boulder movements, all the users so far report great satisfaction and usefulness of the results. Substantial cost savings have resulted from much needed redesigns that would not have been detected without the

model simulations. In some of the cases disastrous outcomes were avoided. The model costs have been miniscule compared to the savings and to project costs. All of these users claim they would definitely use Hydro Lab again, thus contributing to establishing an impression of *sustainability*.

- The Hydro Lab models studies have all been completed on time and in accordance with the agreed budget, thus meeting the *efficiency* criterion.
- The Government agencies Using the Hydro Lab services all praise Hydro Lab for their high quality work.
- Hydro Lab users claim that there have not been any large cost savings compared to using a foreign laboratory, but having Hydro Lab in their "backyard" has been a great advantage. The main reason for no large cost savings has been Hydro Labs extensive use of foreign (Norwegian) experts while training the Nepalese engineers. With a gradual phasing out of foreign experts *cost efficiency* will increase.
- Hydro Lab has conducted the institution building it set out to do both in physical and soft-ware terms. The training of staff in-house and abroad, the implementation of international sedimentation seminars and workshops and the participation in IoE's engineering program are all in line with this goal. This has all been done with the help of NORAD funds in collaboration with ICH and NTNU (see Section 6.6 below) and apparently both *effectively* and *efficiently* by taking advantage of sabbatical leaves of senior researchers as well as thesis writing students from abroad, and using the opportunity to have Hydro Lab staff trained abroad.

6.6 Support to the International Centre for Hydropower at NTNU

The International Centre for Hydropower (ICH) at NTNU at Trondheim started their annual "Hydropower resources development and management" and " Hydropower and environment" courses in 1997 for participants from low- and lower middle income developing countries. Norad decided to allocate NOK 6 million in support of the implementation of these courses for the three year period 1999-2001. The purpose is to contribute to improve the competence and capacity among staff of water resources management and power sector institutions in developing countries in the fields of environmentally benign water resources utilization

133 participants from 31 different countries have taken part in these courses in the 1997-2001 period, with Nepal (20), Sri Lankan (14) and Tanzania (11) having had most participants. Such concentration on certain cooperating countries was a deliberate choice in order to generate genuine institutional capacities in the countries of the participants, and as was observed for the Norad Fellowship Programme discussed in Section 5.2 above, having two or more participants from the same institutions was seen to generate more synergy and establish more sustainable capacity effects than with single participants.

The independent review of 2003 (S. Hansen (2003)) observed that ICH had succeeded in increasing the number of female participants significantly compared to the previous 3 year period.

The review concluded that on the whole the quality of the courses and the course material was high. The course presented the latest in development planning and management tools applied by or demanded used by the international aid agencies and multilateral financing institutions. The participants reported to the reviewer that course content was highly relevant and applied

use oriented. The only field where some dissatisfaction was worded to the reviewer was regarding the course addressing sediment control. However, ICH has been highly recipient to criticism and constructive advise regarding course topics, contents and form of presentation, and keeps changing lecturers and course content in response to participants' feedback. A comprehensive anonymous participants evaluation of the course is mandatory and of great help in the upgrading and redesign of the course elements. The ICH courses are characterized by transparency, encouragement to group discussions and active participation. ICH has developed and maintains an internet network among participants which they all appreciate highly. Course administration appears to be highly cost-efficient and effective.

The review as well as previous back to ICH reports from participants suggests that there is some "trickle down" effect of the wisdom absorbed at the ICH courses. Some participants organize workshops and transfer of knowledge sessions among colleagues upon returning home, but this could be much expanded by having the sending institutions receiving Norwegian funding of their participants commit themselves in writing to have their participants organise such seminars among non-participating colleagues upon return to their home institution.

7. TECHNICAL AND ADMINISTRATIVE ISSUES

7.1 Service Quality and Cost-efficiency

7.1.1 Service quality

Dimensions of quality should be part of any assessment of the state of infrastructure, especially in developing countries. Access to electricity four hours a day – even if it is on a regular and foreseeable basis – is clearly very different from continuous reliable access 24 hours, not only for the investment climate and business operators, but also for households, and affects their willingness to pay for power as discussed in chapter 4.5.

Quality has direct and indirect cost and welfare consequences. Producers and households facing the uncertainties and irregularities associated with power outages and severe voltage fluctuations, must invest in backup facilities, while they have to continue to pay for the irregular and unsatisfactory public utility service. This raises production costs and as a consequence end user prices. This again reduces competitiveness and profit margins, and stimulates potential investors and new job creators to locate planned investments and activities elsewhere where quality of service and associated costs of service provision are lower.

Unfortunately, the quality of available data for documentation of how much quality variation matters is rather poor and assessments of quality impacts are therefore rough, see Estache (2005), pp. 51-57. What is often indicated by available quality of service evidence is that where quality of service is poor, the financial situation of the public utility service provider is poor, and in order to rectify this, tariffs are adjusted to improve revenue collection. Such tariff adjustments tend to penalize the poor since they have the least ability to pay higher tariffs and are often dependent on cross subsidies from better–off users, who due to the poor quality of service are no longer prepared to pay sufficiently high tariffs to allow for cross subsidies. Instead, many of these users invest in costly backup substitutes, and as a result the public utility's financial situation is further deteriorated.

Quality of service observations in the power sector of African countries for the 1990s at first hand suggest a poor and deteriorating average performance, but the picture is somewhat confusing because observation of quality development over time at the country level tend to show different levels of deterioration than data at the operator level, see Estache (2005), p 56. While country- and operator level performance changes are roughly the same for Ethiopia, Kenya and Tanzania, the increment of loss levels are much higher at the national level than at operator levels for Ghana and Zimbabwe. In Mozambique, on the other hand, the reduction in loss levels was bigger at the country level than at the utility level. Finally, in Senegal and South Africa, losses have fallen at the utility level and increased at the country level, while in Zambia losses have fallen at the country level and increased at the utility level! While this overall confusing picture raises serious data concerns, it also suggests that data quality improves as a result of the transparency improvements that follow in the wake of reforms, and with improved data, more of the losses and inefficiencies become transparent.

7.1.2 Cost efficiency

Estache (2005), pp.61-62 reports from a recent full diagnostic study of efficiency gains between 1998 and 2002 in electricity generation in 13 African countries (mostly East Africa).

The study concluded that potential efficiency gains that can be controlled by the operators are in the order of 15% of the performance. In addition, the study show that the level of demand is a much bigger source of concern since inefficiencies of scale are in the order of 24% for the sample. One should take into account that some of this adverse demand-side effect would have been due to the Asia crisis effect.

The main point derived from the above recent studies is that there are significant inefficiency costs in electricity supply and there is a need to assess costs much more carefully.

7.2 How to Reduce Rural Electrification Costs

7.2.1 International experience

G. Foley (1999) reviews the experience on how to reduce rural electrification costs. His analysis of the grid-based approach to rural electrification starts with an overview of the grid/off-grid debate, and concludes that grid-based supply is the preferred rural electrification option and is likely to remain so. Grid-based supply which is reliable and available 24 hours a day poses no restrictions on the number and types of appliances which can be used in the household. Growth in electricity consumption can be accommodated at no extra investment cost.

Cost to rural dwellers can often be significantly reduced by modifying designs relative to excessive standards often blueprinted from donor countries. Each country will have its own cost-saving opportunities for rural electrification planners. In Thailand, materials were standardised and manufactured locally, reducing procurement, materials handling, and purchasing expenses. In Costa Rica, the Philippines, Tunisia and Bangladesh, adoption of the well-proven single-phase distribution system brought major savings over the 3-phase system still widely used in Africa and elsewhere, ESMAP (2005a).

One needs to have a realistic cross-section of the demand profile in the area to be electrified, and on this basis decide appropriate supply characteristics such as the maximum loads for which the supply systems and wiring need to be designed. Requirements regarding building materials in dwellings must also be reviewed in a local context, and the different safety aspects – which must be taken seriously – must also be considered relative to the safety of using the alternative cooking, heating and lighting sources. Not only will excessive design standards impose high costs on the users, but in addition it represents a barrier that makes many potential electricity consumers refrain from joining and continue with the much lower standard non-electric alternatives. Furthermore, specifying standards which are not going to be observed does nothing to improve public safety.

Administrative costs of rural electrification systems can be very high relative to the cost of supplying the electricity. Here the utilities can reduce administrative costs by introducing systems of community meter reading and bill collection. In e.g. some Nepalese villages such systems have developed and adjusted to the local setting, and function successfully as a kind of village cooperatives where the village cooperative members are “all for one and one for all” financially responsible for paying the electricity bill. The power is metered by only one meter for the whole village and since the consumption is fairly uniform among the villagers, meter costs (installation and regular reading of the meters) are substantially reduced by having only one meter for the whole village and then having an elected village member be responsible for collecting payments from the villages with connection and submit the total

payment to the power company. In some cases a micro-finance institution could be the ideal institutional arrangement for generating the investment financing for providing connections and for collecting the payments from the fellow villagers. Such systems can be designed in transparent ways so that "free riders" are avoided and fraud is deterred. Another cost-reducing alternative is that of prepayment meters as adopted by Eskom in South Africa. This system allows the poor households to better plan their affordable electricity use. However, problems of fraud and relatively high costs remain a concern with this system.

When it comes to construction costs, the choice of materials in e.g. poles can result in important cost savings. Furthermore, the utility can incur savings by outsourcing initiatives to the initially connected consumers so that they are encouraged to recruit additional households and provide local poles to link the neighbours to the system. In this way, the utility may settle its bills with the initial household which in turn collects connection and user fees from its neighbours. In many cases this also reduces the problem of illegal connections and meter tampering. As regards house wiring costs, the South African "ready board" can serve as a cheap and easy to install substitute devise for house wiring and thus remove barriers to entry for poor households.

G. Foley (1999), op.cit., p.76, recommends the use of pilot projects to provide useful ways of overcoming the inertia of fear of innovation. An area already designated for rural electrification can be selected for the introduction of a number of innovations, and the successful experiences from such schemes can then be fed into the design for an accelerated national rural electrification programme.

7.2.2 Norwegian experience

Based on the review of high cost customer connections resulting from the socio-economic and demographic structure of poor areas served in several African settings by Norwegian development cooperation, Scanteam (2005 August). p.46, concludes that there is a need to adopt lower cost distribution technology offering the same degree of reliability as conventional systems on a much wider scale. Experience extracted from Nepal suggests that aside from adopting more pro-poor tariffs, there are successful technical solutions available with clear cost-reducing effects:

- By introducing the intermediate voltage level of 1,000V (since normal conductor material is approved and safe up to this level of operating voltage). This provides for expanding the reach of distribution lines from 1.5 km for 400V lines to 5km, and thus makes it possible to save costs in transmission at higher voltage levels. Transforming from megavolts to 1000V and from 1000V to normal end user voltage is relatively simple.
- By introducing cut-out devices that limit power consumption to pre-paid levels for low-consumption customers is very much cheaper than meters to be read before billing. Costs are saved both by eliminating the need for meters and the costs of reading them as a basis for preparing bills, distributing these and then collecting payments from customers,

7.3 Conditions for Choosing Among Off-grid Options

7.3.1 International findings

Much donor- and NGO attention is focused on renewable off-grid options. G. Foley (1999) stresses the importance of comparing such alternatives to a conventional baseline, which is most cases would be a small diesel generators. His survey makes the obvious, but often forgotten or ignored point that **the reasons which make grid supplies unfeasible, such as remoteness, low level of commercial energy demand and lack of local spending power, work equally strong against off-grid options. If off-grid options are to succeed, they need to meet the same stringent success criteria as conventional options**. G. Foley (1999), op.cit. p. 89. It is particularly risky to assume that renewable energy technologies are especially suited to remote or inaccessible areas. These installations need to have in place institutional requirements that secure ready access to lubricants, a supply of spare parts and the technical skills necessary for carrying out regular maintenance and repairs whenever they are required. Furthermore, renewable energy projects, no less than those relying on conventional technology, must be able to generate the cash required to cover the costs of the repair and maintenance service. Dependence on donor grants is non-sustainable.

Against this setting, the small diesel generators or genset possesses the advantages of flexibility, familiarity, availability and low investment costs that makes it the appropriate baseline against which other off-grid technologies are assessed. The immediate test is that if small diesel generators cannot meet the necessary success criteria, it should be seen as a warning sign when assessing the non-conventional alternative, even if the international cost of oil at present is double what it was at the time of the G. Foley review in 1999. Much of this increased fuel cost is offset by the much reduced costs of such equipment supplied by e.g. China and India.

The comprehensive review of solar energy technologies and their viability prospects highlights the enormous developing country potential for solar home systems (SHS) which are now standard consumer items. Photovoltaic (PV) technology constitute a key element in SHSs which can provide sufficient electricity for lighting and a small black and white TV, thus enhancing rural living standards significantly where grid access is not available. Such systems require modest maintenance skills and efforts, but what is required is crucial to SHS efficiency. PV technology is also commercially available for refrigerators for use in rural clinics, but they are costly relative to LPG alternatives. Provided there is a well functioning rural care in place, the PV option is attractive where supply of LPG refills is unreliable. PV technology is also attractive for small scale water pumping. When comparing the typical family expenditures on energy with monthly amortization of various PV-based solar household systems for a range of socio-economic groups (low-, lower middle-, middle- and upper socio-economic group) and realistic parameter values for the different SHS components, the PV-based SHS proved more or less financially competitive at the turn of the millennium. Given the doubling of petroleum prices and continued cost reductions per unit of output from SHSs, it seems reasonable to assume that these systems by now are attractive for installation and use by all socio economic groups of rural households that are excluded from grid linked electricity supply, provided the initial investment cost can be accommodated by means of reasonable credit terms or grants. For risk averse low income families it is likely that a grant is required from them to commit themselves to this option. The essential message from available surveys and market studies suggests that there are large differences between countries and areas within them and between different income groups. It is therefore essential to carry out careful studies of existing energy expenditures and use patterns, as well as market

studies before a PV initiative is launched in a delineated area, as well as mapping the playing field of the rural energy providing competitors (e.g. is kerosene and LPG subsidized and thus undermining the cost-advantage of an SHS system). As regards data needs and information that must be in place before SHS dissemination takes place, the following confirmation is crucial:

- The solar resource is adequate,
- A potential market for SHSs exists and where it is likely to be found,
- SHSs can be made available at prices which are acceptable to a significant number of households,
- Potential partners exist for a pilot commercialization programme.

Solar water heating systems, while simple in principle, are quite demanding in practice, and due to high capital costs have a limited market potential for use in poor rural households. For local schools and clinics, however, such water heaters may provide an attractive alternative.

Biogas and thermal gasification of biomass are proven technically feasible but the biogas niche is fairly narrow and the conditions defining it relatively stringent. However, small thermal gasifiers may prove feasible at the present level of petroleum prices, and there are examples of successful prototype demonstration projects from India.

Wind power can be used for pumping water, for stand alone- and for grid-connected electricity generation, the latter dominating the present interest in this technology where the variation in output can be accommodated. Wind power does not directly meet rural energy needs, but it may contribute to rural development by job creation where the wind turbines are raised, and because the grid need to be extended to the rural area where the wind turbines are to be installed and thus reduce the costs of local rural electrification. Successful wind-power operation require carefully collected meteorological data on wind characteristics along with proper market identification.

Stand alone windmills in combination with a battery for storing the generated power are similar to PV systems and are commercially available. They proved attractive in Inner Mongolia once the area had TV coverage and are clearly competitors to stand alone PV SHS systems in many places

Wind-powered water pumping has a long history of successful application and includes a wide range of technologies from traditional designs to high technology modern engineering designs. Multiblade windpumps are used by commercial farms in many African countries. The starting point for considering such installations is the demand for water. While the required maintenance for problem free operation is not particularly onerous, it is nevertheless critical for cost-efficient operation because lack of proper maintenance can severely shorten the life expectancy of the investment.

Small non-grid hydro schemes are highly site specific. Their main advantage is that they do not require fuel, but running costs can be significant due to remote and inaccessible locations where the maintenance personnel and spare parts must be available when needed. Furthermore, reliable information on how water flows vary through the year and between years is essential for the design of the installation and its civil works. A high proportion of project failures can be attributed to inadequate hydrological and geological data. However, this focus on technical, hydrological and geological data should never be allowed to divert

attention from the most basic requirement of all which is that there should be a market for the electricity produced.

7.3.2 Nordic experience

It appears from Norwegian funded electrification projects in e.g. African countries that one has taken the long-term view that once hydropower plants are operational and a grid is in place, one should aim for connecting even dispersed poor households to this system, even in areas with severe poverty and where a very small percentage of the population can afford to pay the cost of the power supplied. This philosophy as it can be read from e.g. the recent Namacurra Rural Electrification Project in **Mozambique**, as well as the recent Joint Norway-Sweden funded Gurue-Cuamba-Lichinga Transmission Line and Distribution Project (also in Mozambique). In both cases it is established that the cost per new customer connection from the outset is close to NOK 50,000 and there is no sign from the project reviews that overall efficiency and effectiveness is not good. This amount far exceeds the affordability of the large majority of the customers in the influence areas of these projects and such power supply costs also far exceeds the costs of providing power for the basic needs demanded (lighting) and which could have been supplied at a much lower cost by means of solar PVs. Even existing local diesel generators provide cheaper power if the sunk investments are taken into consideration in the ex ante decision. The pro-funding argument appears to have been that once the transmission infrastructure is in place each now customer connection can be provided at a much lower unit cost and the capacity to expand to connect new customer is almost unlimited under prevailing socio-economic circumstances. For both projects it is also argued that it has made it possible to bring down total losses significantly, and this will further reduce the costs of serving new connections.

The Governments of Denmark and Norway have supported **Nepal** in the rural off-grid energy sector, primarily through ESAP under the management of the AEPC which is an autonomous governmental institution under the Ministry of Environment Science and Technology (MOEST). It was established in November 1996 for the development and promotion of renewable and alternative energy technologies in Nepal. ESAP has consisted of the following five components in its first phase (1999-2005):

1. Technical and financial support to AEPC,
2. Promotion of Improved Cooking Stoves,
3. Support to Micro-Hydro Development,
4. Promotion of Solar Energy,
5. Financial Assistance to Rural Energy Investments Component including rural electrification of Kailali & Kanchanpur Districts.

The total budget of the AEPC component has been DKK 10.8 million since March 1999. The ESAP I support to AEPC has developed AEPC from a small, weak government institution to the national central link between government, the public and the private and NGO sector. AEPC has in reality developed into a facilitator between the beneficiaries (end-user, NGOs, private sector) and the government.

Norway approved a grant of NOK 12 million as additional funding to AEPC/ESAP for the period January-September 2004 earmarked to the promotion of mini grid schemes and funding for subsidy to micro-hydro (MH) channelled through the Interim Rural Energy Fund (IREF). Norway and Denmark together approved an additional DKK 30 million funding for

the bridging period October 2004 to June 2005. The bridging period has finally been extended to end June 2006 without additional funds.

According to Danida/Norad (2006), AEPC has contributed to development of the basic regulatory and institutional framework for promoting micro-hydro in off-grid rural communities. The component has been managed by AEPC serving as the project facilitator and quality assuror. It has mobilised suppliers and supervisors and has raised the quality of MH service delivery in Nepal by a.o. establishing four Micro-hydro Service Centres covering the 16 hill districts in Nepal and another 20 district level micro-hydro owners' network with one federation at the centre. Through the programme period the number of MH-manufacturing/installation companies meeting the quality standard has increased from 14 to 27 which have overall resulted in growth of competition, outreach and capacity to deliver from private sector suppliers.

ESAP has promoted a higher demand than initially projected with lower programme costs (more cost effective than initially anticipated). The average cost per kW installed has been NPR 243,908 (approx. USD 3,450) when ESAP management and supervision costs are included. By comparison, the average per kW costs presented in cross country surveys of Micro-Hydro across MH schemes were found to be approximately USD 1,500 in Zimbabwe, USD 2,500 in Peru and USD 3000 in Sri Lanka. The ESAP unit cost is also above the kW costs of the UNDP/World Bank funded REDP project in which comparable costs were found to be from NRS 87,000 (USD 1,279) to NRS 121,000 (USD 1,779) per kW[20]. However, the ESAP supervision and management component includes costs of the significant portfolio of MH projects yet to be implemented. With the planned significant up-scaling of MH under ESAP II, the supervision and management cost by ESAP per kW would be significantly reduced and enhance the cost efficiency of the MH component as measured by kW installed. The Danida/Norad review (2006) concludes that the programme has evidently served to increase quality of MH investments and led to an increase in supplier competitiveness as well as capacity of suppliers in the sub-sector.

Based on the experiences from implementation of ESAP from its inception in 1999, AEPC has designed a second phase of the programme (ESAP II) to be supported jointly by several donors.

In **Nepal,** ESAP/AEPC also has a Solar Home Systems (SHS) component which has been promoted through a similar public-private sector arrangement as the MH component. The Dania/Norad (2006) review reports that the IREF subsidy has promoted growth in number and capacity of companies for supply and installation SHS. Through the registration procedure of eligible companies ESAP has improved quality of products for the benefit of the rural households. While there were 10 pre-qualified companies from the beginning of the programme, the number has now increased to 15 with a significant growth in branch network and installers in target areas of ESAP. A further 12 registered companies have joined the Solar Electricity Manufacturer's Association (SEMAN).

As with the MH component, the SHS component has more than achieved the programme targets with 63,961 SHS systems installed in an equal number of households up to end June 2005. This compares very favourably with the national target by 2007 of 52,000 for the entire sub-sector and ESAP programme target of 25,000.

[20] "Cost and Revenue Structures for Micro-Hydro Projects in Nepal", Dr. Vaidya, Kathmandu, Nepal, 2004.

Even if there were some (even as high as 20% as has been suggested) over-reporting of installations taking place, the remaining SHS successfully installed still exceed the national target for the sub-sector and is far exceeding the programme target.

There is very little information concerning actual cost per kW installed in terms of SHS systems. However, Danida/Norad (2006) refers to a study commissioned by AECP from 2003 which provides some information on the actual cost of SHS from the supplier and the cost to the consumer (i.e. cost less ESAP subsidy). All the four components of an SHS system is imported (solar module, battery, charge-controller and lamps/lamp bulbs). An initial implicit subsidy is granted for companies pre-qualified by AECP in the form of duty exemption. The exemption constitutes approximately 30%[21] on the CIF price. The price of a standard 36W installation for a household is quoted to be approximately NRS 34,500 (USD 486) for the installations being subject to tax and duty exemption.

The subsidy from the ESAP programme for SHS of 30W capacity or more is NRS 8,000 per system. In accordance with the rural redistribution policy which includes special subsidies for remote area electrification, additional 50% and 2.5% subsidy per SHS system is provided to the users in more remote villages and remote village development committees (VDC) of districts respectively[22].

The SHS cost per Wp (peak Watt) installed is significantly higher than for the MH projects. The market price per Wp translates into NRS 958 or USD 13.5 which is significantly above the international prices of USD5.5 – 6.0[23]. This may be explained by the fact that the landed (CIF) cost for the system components (imported) increases system cost due to limited economy of scale (small volumes of import) and freight costs to Nepal. When including the ESAP management and supervision costs the Wp unit cost are USD 17. However, Dania/Norad (2006) claims that an assessment of trends in cost per Wp of SHS also show that the cost per Wp is declining due to increase in number of systems i.e. as for MH to make SHS a viable and cost efficient alternative in off grid rural areas with no other technical alternative. It is again a question of achieving economy of scale which was planned for under ESAP II. As also evident from other country studies it is a question of scaling up the market which eventually will lead to reduced unit costs from suppliers.

Due to the higher cost and import logistics, SHS has most likely serviced poorer household to a lesser extent than MH. It will have the same impact at the household level as MH although less potential for serving commercial activity requiring power for other uses than lighting and low voltage appliances. Solar systems, however, is the only viable alternative to electricity in some locations (there is no potential for either MH or other technologies especially in the inaccessible mountain areas). However, it requires a significant further up-scaling of the market in Nepal and/or increased competitiveness To increase cost efficiency of this technology.

21 Includes the VAT otherwise to be paid on the duty exempted.
22 As per Ministry of Local Development classification.
23 International price analysis by Solarbuzz, Inc. 2006

8. ASSESSING ENVIRONMENTAL IMPACTS

8.1 Experience from the Multilateral Development Agencies

Adherence to the World Bank/IFC/MIGA Environmental and Social Safeguards policies and the guidelines contained in the 1998 Pollution Prevention and Abatement Handbook (PPAH) is a requirement for all WBG projects. In addition, the WBG follows an environmental strategy for the energy sector as contained in the Fuel for Thought (FFT) strategy paper approved in 2000. However, since this FFT strategy paper came out, changes have been made in 2002 in the institutional context that affects its implementation. The changes that have affected how power projects are assessed include (a) "Making sustainable commitments: An environment strategy for the World Bank" (2002), (b) "The energy business renewal strategy", (c) "The poverty reduction strategy paper (PRSP)" and (d) the Bonn Agreement on the Kyoto Protocol.

In the World Bank's OED's 2001 review of the Bank's performance on the environment, it was found that environmental mainstreaming has not yet taken full effect in bank policies, programs and operations, but some progress had been made. The review established that 35% of the Country Assistance Strategies (CAS) produced in 2001 and half of the final PRSPs produced so far had included discussion of energy and environment issues. The review further established that demand for full-scale energy and environment reviews is lower than originally expected under the FFT strategy, with clients preferring more focused analytical and advisory work. The analysis of active Bank lending operations showed a growing proportion with at least one environment objective, growing from 9% in 1990 via 10% in 1997 to 69% in 2001. This shows unsurprisingly that as new environmental guidelines and directives are introduced, lending operations take these actively into account and environmental considerations and issues are gradually mainstreamed into project designs, see Chapter 8 below for a more detailed discussion of how one could fruitfully examine the challenges posed when post-evaluating projects with long lead times and implementation periods and the project design and implementation requirements as regards environment and social impacts change during the project cycle period or after the completion of the project..

In 2003, The WBG undertook a comprehensive evaluation of the Group's experience with private participation as investor in the electricity sector during the 1990s (World Bank, IFC, MIGA (2003) Annex Q, p. 104 - 107). The review included 29 mature projects with IFC as investor. The review found that of the 29 evaluated projects, 23 (79%) have met or exceeded IFC's environmental requirements, compared to 68% for all 1991-1996 IFC projects evaluated. The review found that this outcome was linked to mainstreaming having taken place in the following ways:

- Environmental requirements are specifically built into the plant design criteria,
- Environmental performance criteria are an explicit aspect considered in project completion tests,
- Power plants are technology driven: If designed and built properly, it is highly likely that a plant will be operated within the IFC/World Bank guidelines,
- At the national level, IPPs are sufficiently large that they are audited by national environmental agencies,

- Global power project sponsors generally operated in an environmentally responsible manner when they undertake projects overseas, due to reputation risk.

The six IFC projects that performed less than satisfactory from an environmental perspective, did so for the following reasons:

- Inadequate attention to social issues,
- Inadequate environmental controls incorporated into design to fully meet IFC/WB emission standards.

In the late 1990s, IFC expanded and sharpened it's social soundness reviews by adding specialist staff and by promulgation of guidance documents in key social development areas such as resettlement and public consultation. This change was very much in response to criticism of a hydro project IFC had financed in Latin America that did not adequately address social and resettlement issues.

The WBG (2003) evaluation of the group's experience with private participation in the electricity sector during the 1990s concluded that there is huge untapped power sector potential for progressing beyond "doing no harm" to "doing good" on environment issues. For one, even within contractual constraints, project managers' ability to achieve least-cost and environmentally responsible dispatch of the system's power plants is considerable through the use of the right technology and the appropriate use of plant alternatives. Second, projects can be more environmentally friendly by going beyond the delineated fence line that the industry tends to practice, e.g. by looking into the most environment- and health friendly corridors for transmission lines, and/or environment- and safety focused transport solutions for getting the fuel to power plants.

As regards Greenhouse Gas (GHG) emissions, IFC has policies and guidelines captured in it's 1998 PPAH. IFC's guidelines on energy efficiency are also captured in the 1998 PPAH, but the GHG emissions of IFC-financed power projects are relatively immaterial. The least GHG impact in terms of tonnes of CO2 equivalent/year/installed MW was achieved with gas/naphta-fired generators, whereas coal-fired steam boilers were the least efficient in terms of GHG production. IFC can contribute to GHG reduction and at the same time meet the energy needs of borrowing countries by moving to renewable and switching to cleaner fuels such as gas, but local fuel availability is often determining the design and subsequent fuel efficiency of the IFC financed power plant.

8.2 Norwegian Aid-related EIA Policies and Experience

Norad adopted a system for environmental assessment (EIA system) of aid projects in 1988. This system incorporates checklists for initial environmental screening of different types of projects along the same lines that has been developed by the World Bank. Since then Norad has published separate guidelines in the form of a series of booklets which provide directions for undertaking initial assessments of project categories considered to have major impacts on the environment, see Ibrekk (2005). The EIA system assesses the impacts on:

- The natural environment,
- The natural resource base,
- The future management of natural resources,

- The manmade environment, and
- The health of the population

Socio-economic effects considerations are limited to the extent to which they lead to alterations in the use of the natural resources by the local population. The guidelines consist of three stages:

Initial screening, for which a detailed checklist is to be followed in formulating and asking a series of questions that refer to various categories of potential impact. If one or more of the impact problems are posed in a project, a more detailed assessment is required. Such *an initial assessment* provides an overview of the positive and negative effects of the proposed project, based on available information. Specific guidelines have been developed by Norad for project officers to use when conducting the initial assessment. For smaller project or projects where environmental impacts are considered to be limited or irrelevant the EIA process stops here.

Carrying out the third and final step in the EIA chain is only required for large or environmentally controversial projects. This is a comprehensive full environment assessment which incorporates original data, a more thorough analysis and possibly also cost-benefit analysis. Since each project is different from the previous one, there is no detailed guidelines on format or content, but Norad seeks to follow international best practice such as conducting EIAs with a similar degree of detail and impact coverage as is done by the multilateral development agencies.

These Norad guidelines call for special efforts to follow up on all projects which have been subjected to initial or full assessment. However, the guidelines give no details to assist in this task. The administrative routines and guidelines are continuously reviewed and updated.

While Norway has no legal requirement to consider potential environmental effects of the aid programme, Norad has repeatedly reaffirmed its commitment to evaluate the environment impacts of all development cooperation activities.

Environment is defined as one of the six sustainability elements.With the publication of the new and revised "Development Cooperation Manual", Norad has mainstreamed environmental issues so that these are addressed as part of the assessment of risks and sustainability (Ibrekk (2005)). This new manual focuses on initial screening of legal and policy framework and national EIA standards. Furthermore, it focuses on monitoring and implementation issues, beneficial and adverse environmental impacts, off-site effects, impacts on local populations and health, and mitigation measures. Finally, it prescribes comparison with alternative approaches and the consequences of these and of discarding the programme. The latter can be seen as a variation of the counterfactual or "do nothing" alternative, and requires a completely new and wider approach to data collection and analysis throughout the entire project cycle, including post completion years as a basis for assessing long-term effects. It is expected that the guidelines will be continuously updated and improved in line with similar updates internationally.

In 2001, ECON was contracted by Riksrevisjonen to analyze the quality of the environment impact assessment (EIA) in Norwegian development cooperation, by reviewing a sample of projects in **Tanzania** and **Sri Lanka**, (ECON Report no. 86/01, Project No. 36210: "Miljøintegrasjon i norsk bistand", 23. November 2001). The ECON task was to analyse the quality of the EIA and clarify if the mainstreaming of environment considerations in the

project preparation had led to tangible results in the form of avoided environment damages or less reduction in environmental quality, both for completed projects and for projects being implemented.

The overall conclusion in ECON's evaluation the four different projects, of which one was a power sector project; the transmission line Mbela-Sumbawanga in Tanzania which at the time of ECON's review was nearly completed (Norad had allocated funds for design and an EIA in 1996), was that Norad was on the right track concerning integrating environment concerns in its aid projects. Environment concern have been well mainstreamed into overall project planning from the early stages in the project cycle, and this has made it possible to reflect such concerns in the project designs.

In the power sector case study in this EIA, the Norwegian Embassy has been actively engaged in having environment concerns mainstreamed into the project. The Tanzanian authorities, on the other hand, still have some way to go before genuine national ownership of environment issues is established, but ECON observed increased awareness and concerns.

The report describes the different actions identified in the EIA report needed to minimize environment damages when transmission lines are planned. These pertain to choice of alignment, how the alignment is cleared for setting up masts, and how the masts are fastened in the ground. In addition, it is recommended that settlements are prevented from being established near the transmission lines due to uncertainty regarding possible long term health impacts. The EIA report of August 1996 was considered thorough and comprehensive by the environment advisor at the Norwegian Embassy in Tanzania, whereas ECON judged it somewhat superficial. The EIA report concluded that there were no environmental reasons for not implementing the project, provided adherence to the specific environmental protection requirements are secured by having it incorporated as part of contractor's contract. The tender documents had properly incorporated the EIA recommendations.

Follow up of environmental requirements during project implementation, on the other hand, was inadequate, especially by the Tanzanians, but also from the Embassy, according to ECON. Their review of 11 potential environment problems during implementation concluded that for the most part negative impacts would be insignificant or minor, but two concerns were raised and discussed in the ECON report (lack of concern for and actions to address soil erosion if the project is delayed, and how to close down the diesel generator with minimal future pollution). The project consultant had agreed with ECON that they also had concerns regarding Tanzania's commitment to deal with these two problems.

In 1997, a project was initiated between **Nepal** and Norad (NPL-024) to provided technical assistance from Norway to Nepal to enhance the regulating and monitoring capacity building for environmental impact assessment of hydropower projects in Nepal. This project was reviewed by NCG Norway in 2004, see Laugerud and Balaram (2004).

The local counterpart was the EIA section of the Ministry of Population and Environment (MoPE) since this was considered the weakest part in the EIA chain. As a result of the project the EIA staff was better trained by 2004 and as a result better prepared to handle EIAs and raise the quality of the EIA work, even if they remain understaffed relative to the work load. However, the review revealed a lack of clear feedback from Nepalese authorities as regards where the most severe capacity bottlenecks remain in the EIA chain, and against this situation it would be difficult to accommodate requests for more EIA training assistance.

The review concluded that the institutional cooperation model adopted in this project has not been effective and efficient. For one, the Norwegian "institutional twinning" model between a Norwegian and recipient partner institution centred around a long term advisor (LTA) permanently placed in Nepal has not provided the intended effects (this has also been observed to be the outcome in several other such "twinning" arrangements reviewed in previous chapters). The LTA has not used the backstopping of Direktoratet for Naturforvaltning (DN) in an optimal way, but rather tried to operated the project from his office in Nepal without such direct and continuous backstopping from sector experts. Such hands on project management has - according to the review – not been adapted to the capacity and capability of the EIA section of the MoPE, but instead resulted in the project implementation being pushed by the LTA to such an extent that the local staff to be trained has not been able to follow. As a result, external consultancy support not originally planned for has been needed to deliver the planned outputs towards the end of the project. This has created confusion and weakened the local ownership to the project outcome in general, and instate resulted in the project becoming a sort of a "state within the state".

Secondly, the review questions whether DN of Norway should have been the main Norwegian partner institution to start with, since it has very limited experience from planning of similar projects. In fact. DN has very limited direct project operations experience from developing countries in general, and in Asia in particular. There are Norwegian consulting firms with much stronger relevant project management experience in this hydropower field, and which has direct Nepal experience. Such a company could have been engaged by Norad to coordinate input from other professional institutions in Norway, such as NVE and DN. Such consultants could then provide the required quality assurance of the project by demand the highest standard of the support services delivered under the contract.

As established earlier in this report from the reviews of similar Norwegian "twinning" arrangements involving Norwegian state institutions with counterpart institutions in e.g. Uganda , Mozambique and Palestine, a better, more effective and more efficient cooperation modality would have been short-term advisory services from Norway, with longer periods in between the visits. So that the local staff could work independently at a pace suitable for their own ability and capacity to handle their normal daily work load along with the new tasks under the project. This experience show s again that institutional capacity building related to reforms and new working modalities is a process which must take the time required and have an almost "open ended" contract in order to establish the trust and wholehearted cooperation and local ownership so that the outcome of the aid cooperation can be sustained.

8.3 EIA Procedures and Practice in Recipient Countries

Unsurprisingly, EIA in developing countries - even though such procedures were first observed in some such countries in the mid-1970s – varies significantly from country to country in terms of interest, commitment, local ownership and capacity and willingness to deal with environmental and social impact issues, and its performance generally falls far behind that of EIA in developed economies, Ibrekk (2005), p.9.

By the mid-1990s the World Bank reported that some 70 out of the 110 developing countries had enacted some form of EIA legislation (Ibrekk (2005)). It is by now well established that legislation is the essential precursor to an effective EIA system anywhere. However, enacting EIA legislation is the easiest part of this process so long as there is no punishment associated

with broken promises that lead to lack of monitoring and lack of environment damage preventive capacity. The legal basis of EIA systems may be weak, non-mandatory or non-existent in many developing countries, as for example is the case in many African countries. Ibrekk (2005) concludes that "*The organizations responsible for implementing IEA provisions in such countries are often new, lacking in status and political clout, and working in a culture where an absence of information sharing considerably reduces their influence. Environment ministries are bypassed by other, more powerful, ministries*."

However, for the most part, such EIAs were not implemented in response to a widespread indigenous demand for better environmental management and protection, but instead they were donor driven and accepted by the recipients due to the donor conditionalities that such EIAs be produced. Over time the donors' environmental safeguard requirement have become increasingly specialized and prescriptive and costly for developing countries to adhere to. A consequence of this is that some developing countries have in place two classes of programs from a safeguard perspective; one strict one which is applicable to projects financed by strict donors and the multilateral finance institutions (MFIs), and another applicable to domestic projects. The dilemma this creates is that if donor safeguard demands become to strict and costly, the developing country may decide to drop the concessional donor financing offered and seek other financing which may be financially less attractive, but whose overall economic cost is less due to the lax safeguard requirements.

The general observation by most analysts is that lack of political will and vision is undoubtedly the biggest obstacle to making EIA effective in developing countries. Ibrekk (2005) in his review of these issues concludes that there is insufficient political priority accorded to the environment in general, and EIA in particular. Most politicians choose to ignore the well known relationship between rational management of the environment and long-term social and economic development in favour of more immediate goals that often come to the fore as a result of major policy induced distortions of economic incentives provided by the state to consumers and producers. This lack of political will is unfortunately also allied to widespread greed-based corruption.

9. CHALLENGES FOR THE FULL EVALUATION

9.1 The "Chicken and Egg" Issue

The quality of policies and projects is judged by means of analyses along the five DAC-defined evaluation dimensions: Relevance, effectiveness, efficiency, impact and sustainability. This immediately points to the importance of having in place a clear description and understanding of policy objectives and conditions that the aid supported activities are subject to. Equally important – given a good understanding of these objectives and their timeliness relative to the time period during which a project or aid supported activity was decided on and implemented – is a good understanding of the forces at play that can support, weaken or even obstruct the outcomes of the activity.

Here the evaluator is to a large extent at the mercy of those who designed and implemented the project or the policy initiative being evaluated. This situation is compounded by a "chicken and egg" like setting in that the relevance and quality of data available for analyzing effectiveness, efficiency, impacts and outcomes very much is determined by how those who designed and implemented the project/policy initiative themselves understood and perceived what issues were of importance and in need of documentation.

Obviously, if those responsible for designing and implementing the activity are unaware or ignorant of key cause and effects linkages, it is unlikely that they would have prepared the project monitoring such that variables had been defined, data represented these variable collected and finally analyzed to understand the structure and strength of such causal relationships. The above review in chapters 3, 4 and 5 of Norwegian institutional "twinning" agreements with various poor partner countries indicate that such up-front considerations about relevant progress monitoring and development cooperation relevant impact documentation has been largely absent.

For future aid supported activities and for autonomous actions by government agencies in aid supported countries part of the capacity building initiatives should be targeted at improving the coverage of understanding key linkages between project elements/policy dimensions on the one hand, and impacts on stakeholders and the environment, on the other. However, our understanding of which such linkages one should be aware of and collect data to verify, and which linkages we attach importance/priority to regardless of awareness, changes over time as a result of changing political priorities and as a result of increased understanding of linkages and direction of causes and effects.

For example, the changing view during the last three decades on what to take into account when deciding whether to construct a power project is reflected in the introduction of new and increasingly stricter guidelines, standards and criteria imposed on projects and that executing and implementing agencies have to document that they meet as part of the contract between them and the donor. This again is a result of increased understanding and awareness of the complex inter-linkages between the many physical, environmental, cultural and socioeconomic factors at play in such projects. During the last three decades power sector projects have become subject to increasingly demanding environment- and cultural heritage standards, resettlement and indigenous peoples requirements, and many donors now require specific studies of the gender and poverty impacts of projects and policies.

Even though shortage of appropriate data and the level of theoretical and methodological understanding thus are directly interlinked, it is convenient to discuss them separately from the perspective of an evaluator in the following.

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9.2 Knowledge Gap I: Shortage of Appropriate Data

With the long lead times (often 10 to 20 years) in the power sector from project identification and formulation until completion and before all effects of it are stabilized, it is no wonder that the data requirements at the beginning of the project were much less comprehensive and demanding than those one would have wished to have in order to answer the questions derived from the new and sharpened directives and criteria being introduced as part of the donor's aid policy while the project was being implemented. As a result evaluators will notoriously be dissatisfied with the data at their disposal for determining impacts and outcomes, and yet, they cannot really blame those who initiated and implemented the projects because "they did not know any better", or rather, the set of questions asked at that time in the project cycle were different from those emphasized at the end of the project cycle.

Data that have been collected before during and after a project reflect the project aspects the implementing agency and the donor agreed on to be of concern for assessing the project value. The parties deciding on the data needs based on their understanding of what mattered at that time in the project cycle, given the budget available and the agreed-on priorities between the contracting parties.

However, what data needs they agreed on also reflected their insight and understanding/awareness of socioeconomic, physical, environmental and cultural variables at play. As the understanding of what depends on what and how increases over time, the demand for data to analyze impacts and outcome changes. This is not only a question of adding new dimensions such as environment-, resettlement-, indigenous people-, and gender concerns to topics to be analyzed and documented from an impact perspective, but also of the much more stringent demands for comparing project outcomes to a control, i.e. a counterfactual situation, in order to avoid e.g. double counting of project benefits which would systematically lead to unrealistically high values attached to such projects.

Shortage of relevant and much needed data in order to do a quantitative evaluation (and what would have been desired for a full scale appraisal at the beginning of the project cycle) is therefore in part a reflection of the insufficient knowledge level in the concerned field (impacts of power sector) at the time the data needs are determined, and this again must be assumed to have resulted in a different and less comprehensive set of competing priorities when formulating the project as compared to those in place when the project shall be evaluated.

During the 1950s, 1960s and 1970s when many of the large power sector projects were planned and implemented, detailed analysis of stakeholder impacts, and among these, the impacts on the poor, were not part of the appraisal agenda, and as a consequence, post evaluation of such impacts could not be very sophisticated. In order to identify the extent of impact of power sector reforms on the poor, it is necessary to establish a distinction between the poor and non-poor. In many African countries, e.g. Kenya and Uganda, income-differentiated electrification data are absent, and one needs to resort to proxy variables. In theory, one such proxy variable could be the lowest tariff band to estimate reform impacts. However, when such time-series data in the required format is unavailable one needs to search

further for other proxy variables to carry out poverty impact analysis. Besides, this variable would be rather useless in practice since the overwhelming majority of the rural population (99%) with no access to electricity would not have been captured.

A more realistic proxy for such impact analysis in such countries is to assume that all rural households are poor. Both the Kenya Welfare Monitoring Survey and the Uganda National Household Survey provide support for this assumption. There is a need to track and develop an income-differentiated database on electricity access, both in urban and rural areas. Such a data base would be useful for the newly formed Rural Electrification Board (REB) in Uganda to monitor its performance in meeting the government's 10% electrification target by 2012, and for similar institutions elsewhere.

A.L. Mathiassen et al (2005) recently addressed the need for energy-related data and statistics in view of Ugandan policy statements on poverty eradication. Based on their review of recent such policy statements, they concluded that "*statistics should aim at providing timely and reliable information on access and use of energy by source. Statistics should enable for monitoring of national production and use of energy and this production's effects on welfare and possible environmental degradation. This statistics should feed into the National Integrated Monitoring and Evaluation Strategy (NIMES).....the statistics should aim at providing regional breakdowns as well as breakdown on different types of households and industries and not least a distribution on urban/rural access and use"* (p.11).

Unfortunately, data sets on which to base evaluation of energy services' role in contributing to household welfare outcomes are remarkably short in supply. At present the data on household energy use through the World Bank's living standard measurement studies (LSMS), which are regularly carried out in developing countries world-wide, is insufficient for extensive analysis of energy policies and projects. At the same time, specialized household energy surveys often are not designed for such analysis; the are seldom national or project influence area-relevant in scope, and do not cover the breadth of topics involving other sectors, which is the hallmark of the LSMS surveys. ESMAP (2003) found that few of the rural energy programs – whether promoting conventional or renewable energy – start with an in-depth assessment of markets for these services, including the needs of the people they are meant to serve. Most rural electricity monitoring and evaluation programs measure strictly quantifiable information, such as the number of new grid electricity connections or the number of renewable energy systems installed, but they are typically not designed to measure socio-economic impacts, thus often resulting in the masking of poverty- and gender-specific consumer choices and perceptions.

K. O'Sullivan and D.F. Barnes (2005) at ESMAP in the World Bank have recently developed guidelines for developing energy modules in the (LSMS) to better meet such information needs. The background is that accurate data on household energy use combined with other data of household well-being such as those collected in the LSMS, including consumption, income, health and education is essential in monitoring progress in the household energy transition from traditional biomass fuels to modern fuels and electricity, and in order to evaluate the effect of government energy policies on living conditions. Equally important though, this must not be seen as an isolated data collection approach limited for use in monitoring and post-evaluation work, but it is meant as an approach that is useful for project design as well. Demand orientated guidelines for designing and developing rural energy systems, makes it possible to more effectively target the needs of specific stakeholder groups such as women and the poor rural households. Experience with conventional supply driven

rural electrification project that have not taken the disaggregated demand side explicitly into consideration from the design stage, has been that the benefits have often accrued primarily to the rural elites and relatively well-offs, ESMAP (2003).

Based on experience over the years with which energy question formulations work best and provide the most consistent results, these new guidelines point out important data gaps and weaknesses in current LSMS surveys with respect to energy questions, and discuss how such questions can be better formulated to yield data that is more useful for energy policy and project analysis. K. O'Sullivan and D. F. Barnes (2005) point out that data from LSMS surveys can be used before a policy or project is implemented to construct hypothesis of the welfare changes that may occur. If data is available from successive LSMS surveys, the first carried out before the policy or project intervention and the second afterwards, the change in household welfare as a result of the intervention may be observed.

Most LSMS surveys have contained some energy questions to the households relating to:

- Electricity service providers,
- Type of energy the household uses,
- Expenditure on commercial fuels, and
- Energy usable durable goods

In addition, the LSMS contain some community questionnaires with questions regarding energy availability, coverage and prices. But the level of sophistication varies widely, according to K. O'Sullivan and D.F. Barnes (2005), p.13. They therefore identify the missing questions that ideally should be included in an LSMS energy module to provide for proper appraisal and evaluation of stakeholder impact and outcome analysis. The most important such questions to be included in the future LSMS energy modules are:

- Accurately characterize all of the available energy options that a household does not choose,
- Include questions on connections fees in the community questionnaires,
- Include detailed questions on service quality or supply reliability from service providers and retail distributors,
- Ask households on their coping costs, e.g. how they behave during power outages or fuel shortages,
- Ask directly about fuel and electricity consumption,
- Determine household attitudes towards various sources of energy, e.g. how they perceive them in terms of health impacts, convenience, cost and reliability.

These ESMAP experts recommend that prototype energy modules be designed for insertion in an LSMS as stand-alone modules, but with complementary questions. However, depending on the site and country-specific LSMS circumstances the alternative of integrating e.g. the questions from a light-bulb- and appliances-module into the durable goods-module should be kept as a possibility. Ideally, however, K. O'Sullivana and D.F. Barnes (2005) recommend the inclusion of energy modules in a LSMS in order to as effectively as possible provide a basis for answering the pressing impact and outcome questions related to projects and policies being assessed. These prototype modules are presented and the operationalization of them discussed in detail in their December 2005 ESMAP Report No. YY05. They are:

- The fuel sources module,

- The electricity sources module (grid),
- The electricity sources module (off-grid),
- The durable goods – light-bulbs and appliances module,
- Electricity and fuels in the community module.

LSMS surveys are typically national surveys. Specialized household energy surveys – on the other hand - are often implemented in a delineated area, e.g. one in which a pilot rural electrification or improved stove programme will be implemented. LSMS survey are comprehensive and costly to implement (USD 0.5 – 1.5 million). Specialized household energy surveys including the above prototype modules can be implemented within a budget of USD 50,000 – 150,000, depending on the size/population of the area covered, accessibility of the area to the surveyors, and the number of prototype module questions to be included. Collecting the desired data on household energy use through a well-designed LSMS survey offers an extremely cost-effective data collection opportunity.

A. L.. Mathiassen et al (2005) reach similar conclusions and recommendations in their **Uganda** case study. These conclusions and recommendations are likely to be transferable to most other low income African and Asian countries.

They find that many of the recently conducted surveys, censuses, and case studies include information related to Ugandan households' and the private sector's access and use of energy by source. The also find that a substantial amount of administratively collected data exists. However, the somehow scattered storage of energy-related statistics makes it difficult for the stakeholders to efficiently explore this information.

They have carried out a comprehensive review of coverage, comprehensiveness, relevance and reliability all available Ugandan statistics with the objective of illustrating how available data on access and use of energy by household and private sector can be linked to poverty in Ugandan households. They have found that the scope for analysis of income generating effects of electricity could be substantially improved with information on grid availability in community and use of electricity in enterprise. Their study illustrates how some small adjustments in the household expenditure surveys could substantially improve the possibility for revealing aspects on the link between energy and poverty and further to the pressures on the environment, and how biomass energy use impacts on health. There is thus a need to address issues on efficiency, prices and amount of wood-based energy by poverty status on a national level. Some of these needs are met with the information on type of stove used and time used for collecting firewood as included in the Ugandan National Household Survey 2005. With such data the analysts would be better able to link incidence of respiratory diseases to not only use of firewood and dung, but also to the kind of stove used. From an environment perspective one could link the change-over to more effective stoves to reduced demand for firewood and thus relieved pressures on scarce biomass resources. And finally, such data would also make it possible to draw conclusions regarding the use and value of time savings (less time used to collect firewood can now be used for other tasks) to firewood using households from having more effective stoves in place. Another important improvement of the expenditure survey they point to would be to derive prices and quantity used of the respective energies.

Their analysis further shows that available data are insufficient to enable analysts to reveal whether the observed strong correlation between electricity use and welfare and economic and social development at both household and community level is due to more wealthy

households/communities getting access to electricity and/or that the household/communities become more wealthy when they get access to electricity. Time series data on welfare and change in use of electricity would shed light on such causal relationships.

Combining statistics from the population and housing census with digital maps containing administrative boundaries provides information on geographical patterns of energy use and inequalities and has opened up a whole new field for analysis.

The WBG (2003) evaluation report of private sector development in the electricity sector concludes that **little is known about the impact of institutional power sector reforms on the poor because data have not been gathered systematically.** Based on a review of 154 projects, OED of the World Bank found that Bank project documents provide very little data to evaluate the impact of power sector reforms on the poor. **The data that are available tend to be anecdotal and not based on sound monitoring and evaluation systems, or empirical evidence. Many opportunities for learning about such impacts and distributional effects were missed when reforms were designed and implemented in the 1990s. Environmental guidelines and criteria had been developed first and foremost for investment projects and only gradually did the focus widen to include concerns about how policy reforms affected different stakeholder groups.** Much of the recent (since the turn of the Millennium) ESMAP analytic work reviewed in this State of the Art report is designed to remedy these lost opportunities.

As regards Norwegian – as well as Nordic – funded power projects in developing countries, the above lack of relevant data for assessing net impacts is the rule and not the exception. The Namacurra Rural Electrification Project in Mozambique discussed above is quite representative in that it was designed, planned, approved and implemented without providing for the establishment of a socio-economic baseline and selecting control areas for counterfactual analysis of impacts. As a result one has no baseline studies for the purpose of any satisfactory counterfactual, or before – and after assessments. The social component in the environmental impact study does not suffice in providing the required verification data.

Scanteam (2005 August) in its review of Norwegian aid to the power sector of **Mozambique** concludes strongly that in none of the electrification projects reviewed is any specific monitoring and reporting on the cross-cutting subjects related to poverty, gender and the environment being done. Their conclusion based on interview responses is that it is unlikely that the subjects have been addressed. They therefore strongly urge that the practice of designing and carrying out socio-economic baseline studies consistently and in an appropriate manner become mandatory for all infrastructure projects. Institutional cooperation projects should be planned and implemented likewise. Ex-ante and ex-post data are increasingly important to substantiate arguments in the poverty eradication and economic growth discussion, and the explicit formulation of and aid policy commitment to the Millennium Development Goals has made the mainstreaming of such procedures even more urgent. One needs to identify the areas where one can draw valid and reliable conclusions regarding ppoverty impact of different energy interventions. Where information gaps exist, one must agree on an action plan to generate the required data. Then based on more complete information, one must agree on more efficient and effective donor support for poverty reducing energy interventions.

9.3 Knowledge Gap II: Incomplete Understanding

The issue of causality is a fundamental concern for development research. Causal models are needed to link improvements in energy infrastructure services with such desired outcomes as improved household health, education, more time for leisure, and income. To be able to do this, the analyst must know how an intervention (policy change/reform or a project) will affect the stakeholders' (households, farmers and non farm enterprises) decisions, and in turn, energy markets. But for this to be possible, the analyst must have available variations in the explanatory variables (e.g. the price of fuel or electricity) that result from changing cost conditions and affect stakeholder decisions, in order to identify the real demand function. In cases where there is an unchanging national tariff, such price variation will not be available. When the policy is to apply increasing block tariffs, the marginal and average prices a household pays depend on its own decisions about how much to use.

A.L. Mathiassen et al's (2005) analysis of limitations and potentials of Ugandan statistics has shown that available data are insufficient to enable analysts to reveal whether the observed strong correlation between electricity use and welfare at both household and community level is due to more wealthy households/communities getting access to electricity and/or that the household/communities become more wealthy when they get access to electricity. Time series data on welfare and change in use of electricity would shed light on the direction in such causal relationships. With the opportunity to follow up households over time, before and after they start to use for example electricity, one would have available a highly efficient approach to analyze the impact of improved energy on poverty.

There is very little empirical documentation of the direction of causality between better levels of hard infrastructure (e.g. road access, electrification, telecommunications) on the one hand, and higher rural incomes, livelihoods and poverty. Does the Norwegian power sector aid documentation provide the data necessary and sufficient to document such linkages or the lack thereof? This should be a key issue in the full evaluation.

To answer such fundamental impact questions one needs a data base that links household responses from two surveys; one from before the hard infrastructure, e.g. electrification, was provided, and the second covering the same households after it has been provided, see e.g. S. Chowdbury and M. Torero (2005). The household sample must be such composed that the primary target groups (e.g. women headed households, landless households and more generally, poor households are properly represented. This combination of time series and cross section data allows a comparison of the well-being of the different categories of households in the sample with and without access to electricity (or whatever hard infrastructure is included in the surveys), and theoretically it captures both direct and indirect potential impacts of electrification, road access, and better access to information. To further be able to understand in what form the changes materialize, one would need to disaggregate the welfare change resulting from e.g. electrification or improved access according to:

a) The impact of infrastructure changes on the share of hours allocated to agricultural versus non-agricultural work activities (to test the hypothesis that access to the hard infrastructure being studied leads to greater opportunities for non-farm activities),
b) The effect of changes on the household's total working hours (to determine the impact of the change on overall employment opportunities), and
c) Changes in return to labour (i.e. hourly wages) allocated to agricultural and non-agricultural activities, assuming the scope exists for increased market efficiency through increases in the purchasing powers of rural households.

However, to carry out these comparisons and determine whether household welfare changes as measured actually result from access to the relevant form of infrastructure (that is, causality), a control group of households with similar characteristics (i.e. living in a similar community, share similar socio-economic characteristics and be of similar composition) is needed. This can be constructed based on what is called the "matching method", whereby a relevant control or non-beneficiary household (i.e. one without the prescribed access) is assigned to each beneficiary household (i.e. one with access, e.g. having experienced electrification).

Using the panel data from the available household income expenditure surveys now available from different time periods in an increasing number of developing countries, one should take advantage of the fact that both kinds of households (with and without having experienced e.g. electrification) are available, thereby permitting a full "difference-in-difference" impact analysis, which compares the results of before and after comparisons of beneficiary households with non-beneficiary households.

To isolate infrastructure access, e.g. electrification, as the variable, the control group must comprise households that are extremely similar to the beneficiary households in all respects other than access to infrastructure, e.g. electrification. Once the matching is done, the mean impact of the programme may be estimated as the simple or weighted average of the impact for each matched pair of households (beneficiary and non-beneficiary).

LSMS survey data – especially if the new energy modules proposed by K. O'Sullivan and D.F, Barnes (2005) above are included - can be used to effectively estimate the benefits of infrastructure investments and policy interventions, and thereby assist infrastructure analysts and task managers with the appraisal of new projects in the following alternative ways:

- The simplest method is to use data on the household costs of coping with unreliable services as a measure of the benefits of service quality improvement, based on the argument that if service quality is improved, households will experience economic benefits in the form of cost savings because they no longer will spend financial resources on coping with unreliable services,

- Predict behavioural changes in response to changes in e.g. pricing policy by means of a demand curve estimated for a particular service based on price-quantity relationships derived from LSMS energy questions. In this way the analyst may also use the demand curve to estimate the welfare gains and losses for a household when e.g. switching from one lighting source to another, using standard benefit-cost methods.

- A third method is to include a "stated preference" module in the LSMS survey whereby a sample of respondent of similar socio-economic characteristics is asked if they would agree to a specified monthly increase in electricity bill in exchange for a specified and guaranteed improvement in service reliability. By varying the monthly increase between the respondents, one can trace the willingness to pay for such service improvement. (Experience with stated preference estimation techniques from other sectors in developing countries, suggests that they can be used successfully in the household energy sector, according to K. O'Sullivan and D.F. Barnes (2005).

A 2002 ESMAP study of measuring the social and economic development effects and benefits of rural electrification in the Philippines (ESMAP (2002a)) used household survey data to estimate the benefits of electrification to the household in monetary terms by quantifying the amount of fuels and electricity consumed for lighting and the willingness to pay for this. This is really the only way to estimate such a demand curve and this method is now increasingly used in rural electrification. This information is combined with information on the lighting service obtained from the different devises the household uses.

An important finding from ESMAP's 2002 study is the need for more case studies of the same kind to provide more reliable documentation on how improved energy availability contributes in some broad multiplier way to economic development, especially at low income levels.

ESMAP (2003) proposes the combined use of a participatory assessment and socio-economic impact survey to achieve a better understanding of the demands and preferences of the different stakeholder target groups in a project area, and to apply this combined use from the very outset in the project cycle so that the early findings can contribute to reaching an optimal design of the project from the perspective of the project target groups. A participatory assessment includes a series of activities such as community mapping, stakeholder meetings, and focus group discussions and aims at soliciting the perceptions and priorities of the target communities. Open discussion within and among community members and the various interest groups increases the chance of obtaining credible and relevant information, allowing biased or incomplete answers to be checked by group dynamics. Participants identify problems and solutions and are thus more likely to take ownership of the outcomes. In addition, community members also gain practical tools for monitoring infrastructure construction and service delivery, and is thus a local capacity building tool as well. This process thus facilitates acceptance of the need to monitor projects during and after implementation and thus contribute information needed to establish time trends.

More quantitative information is needed to substantiate how the overall opportunity cost of less efficient energy forms and the relative pay-off from use of more efficient forms influence on the development process. This is especially relevant at lower levels of development, where access to such impact-measuring data for the project area and control area data so far has been rather limited.

9.4 Measuring Stakeholder Impacts: ADB's Approach

Carefully designed quantitative studies for comparing impacts and effectiveness of projects and institutional reforms with a "without" situation are rarely found in Norwegian aid cooperation activities. However, methodologies have been developed and field-tested by the multilateral development institutions, e.g. the World Bank (see the examples described from various ESMAP activities and the Foster and Aruajo (2004) study in Guatemala where impacts of reforms on different user- and income categories have been estimated).

The Asian Development Bank (ADB) has recently developed analytic methods for estimating stakeholder impacts, e.g. poverty incidence of projects and policies, see S. Hansen and E. Kwon (2004). The first step in such poverty incidence analysis is the distribution of project economic costs between the selected stakeholders of interest to the decision makers (the borrower or recipient). The impact on international stakeholders. i.e donor or lending

institution, is not considered in this illustration. This means that only costs incurred by the borrowing/recipient developing country are considered.

The economic valuation must first adopt assumptions for converting financial costs into economic costs:

- If it is assumed that there is a surplus of low productivity unskilled labour in the project area, a Shadow Wage Rate (SWR) of less than one is applied which reflects that the economic value of unskilled labour inputs are less than actual wages paid to the workers.

- Where there is scarcity and artificially constrained prices, one may apply a shadow exchange rate factor (SERF) above one to convert the cost of imported or internationally tradable items to domestic prices and applied to equipment which is assumed to be imported (or can be internationally traded).

The costs of the project will include:

- The capital costs, including physical contingencies, the costs of land acquisition, and costs of compensating or relocating people affected,
- The costs of operating and maintaining the project, including the costs of replacing depreciated equipment, and similarly in the baseline (without project) case
- The costs of expanding supply capacity to maintain tolerable supply conditions are also included

The financial costs are next disaggregated so that labour costs and taxes and duties appear as separate financial cost items. Economic costs are then derived from financial costs by:

- Excluding taxes and duties (which are transfers),
- Converting the costs of imported items to domestic prices using the SERF, and
- Converting unskilled labour expenses to economic costs using the SWR

The eventual economic cost estimates of the project can be split up and displayed as in Table 9.1 below.

Table 9.1: Calculation of Present Value-project economic costs with distribution analysis calculated at xx% discount rate (Million $$, 2006 prices)

Cost Components	Total Financial Value of costs	Conversion Factor	Total Economic Value (EV) of costs	Government Share of EV (Stakeholder) of costs	Labour Share of EV (Stakeholder) of costs
Capital and O&M Costs:					
Labour					
Taxes and duties					
Total costs					

Applying the assumed SERF and the SWR to foreign exchange costs, and to unskilled labour components in capital- and O&M costs, results in weighted conversion factors for capital and O&M cost elements, for the labour cost element (reflecting that unskilled labour constitutes a very small overall component of costs), and tax- and duties revenues paid by the project owner (i.e. the government) going back to the government.

The next step in the poverty impact analysis is to distribute the benefits by stakeholder groups. These benefits constitute the financial benefits (tariff revenues) accruing to the project owner and the non-financial economic benefits accruing to other stakeholders (the specification of such stakeholder groups for explicit inclusion obviously depends on the terms of reference and orientation of the project). Such stakeholders ca be selected as follows:

- Households
- Enterprises, which in this study is the sum of benefits going to enterprises (farmers, various service providers and industry, and with reliable knowledge of the eventual passing on of savings from enterprises to households; a split between these should be sought)
- Construction labour which is paid above their going opportunity wage rate
- The Government as project owner
- Local communities in the project area

The tariff revenues received by the government, is paid by the electricity users, and is therefore initially distributed among enterprises (farmers, shops, industry, and others) and households. Enterprises will pass on these tariff charges to the households will pass on in the form of increased fares.

Table 9.2: Distribution of the PV of Project Benefits by Stakeholder Groups, (Million $ in 2006 prices discounted at xx%).

Stakeholder group / Benefit component	**Total economic value**	**Government's Stakeholder Share**	**Households***	**Enterprises***	**Labours Share**	**Local communities**
Tariff revenue**						
Operating costs savings on the project						
user savings due to project						
Other benefits***						
Total Benefits						

* If data permit, households and enterprises can be disaggregated into power users and non-power users before and after the project.

** It is assumed here that the incidence of tariff- payments occur on households and enterprises and in proportion to their operating cost savings. These payments are transfers from electricity users to the government (power plant owner).
***Other benefits are here the aggregate of (a) generated power consumption, (b) operating cost savings to enterprises savings, and (c) energy source diversion benefits. Such benefits can be split into health benefits, education benefits, increased profits due to reduced outages and improved investment climate.

Negative externalities related to environmental and social impacts have so far typically not been valued in economic terms. These are impacts experienced as welfare losses on stakeholders but not captured by changes in market prices However, at least these negative externalities should be attempted measured in some physical terms and allocated to those affected by means of some income-distributed headcount identifying how many in each income class are affected (a) slightly, (b) severely, as a basis for designing and budgeting compensating measures.

Based on the costs savings of Table 9.2 above as a basis for all benefit calculations, the next step is to distribute the net benefits (economic) by the main stakeholder categories (not yet disaggregating each such group by income or other poverty indicator). This simply means deducting total costs from total benefits for each identified stakeholder category in the above table. This requires a careful provision of data for each stakeholder group in advance so that its role can be estimated.

Table 9.3: Distribution of the NPV by Stakeholder Categories, (Million $$ in 2006 prices discounted at xx%).

Stakeholder category	**Total Economic Value**	**Government Stakeholder Share**	**Households share***	**Enterprises share***	**Labours Share**	**Local communities**
Total Benefits						
Total costs						
Net benefits (ENPV)						

* Households and enterprises may be divided into power connected (and user) ones and those not being connected. such data are required for before and after the project is implemented

The next step is determining the incidence of net benefits by stakeholder income and power connection status for the different stakeholder categories. This step could also be applied to many different levels of disaggregation of stakeholder categories (e.g. by gender, ethnic minority, etc). It is of particular importance that stakeholder groups that differ from each other in terms of poverty incidence are kept apart.

What is now needed is therefore reliable data on income- and/or expenditure distribution – at least by the categories poor and non-poor (according to an agreed poverty line), but preferably by “very poor”, “poor”, “close to poor”, and “non-poor”, and each divided into power- and non-power users. The various cut-off points on the income scale are taken from the project Terms of Reference in question.

Estimating the proportion of ENPV going to the poor as defined here is a process requiring careful step-by-step assessments of poverty impacts at a rather disaggregated level for many subcomponents. Energy users, for example, include both urban and rural households and enterprises (shops, farms, industries, etc). However, the ratio of poor is very different in these categories. Therefore one needs to establish these individual sub-category poverty shares as well as their shares in the total energy use volume. Also the share of poor among unskilled workers must be estimated specifically for each project, and as a general rule one needs to apply different poverty cut off lines for rural and urban incomes (the latter being much higher).

In this estimation, this means that one needs to separate a.o. the intra-project area power use from power to/from the project area,, because for some projects, transmission of power to adjacent or far-away destinations is a major project goal. In table 8.4 below, the proportions of benefits going to the poor for each stakeholder category is the weighted average for the sub-stakeholders in questions, e.g. intra-project area power demand versus transmission to outside destinations.

This poverty impact calculation procedure includes the financial tariff revenue accruing to the project owner (public utility or private investor, or a combination). As a result the benefits to the electricity users are reduced by the same amount. This means that the poverty impact of the project operation depends on the share of government net economic (including toll revenue) benefits going to the poor (over the budget for various poverty reducing policies and actions) as well as the share of the poor in the different benefit categories accruing to the different stakeholder groups (other than the government). In fact, the sensitivity analysis of overall project feasibility with respect to tariff level unsurprisingly shows that the overall project feasibility is sensitive to level of this tariff, if power users are price sensitive. This means that a change in the tariff level will change the poverty impact of the project..

The poverty impact assessment requires a set of disaggregate poverty impact assumptions based on project area data for each stakeholder category and benefit component in order to assess poverty impacts of e.g. new connections.

In the table below, prepared for illustration of how to do poverty impact assessment, the stakeholders are divided into two income groups only: Poor and non-poor. Clearly this is an arbitrary dividing line because:

- A NOK 1,000 per capita annual income is but one of many poverty lines. There are many local poverty lines applied for national planning purposes.
- It would be of interest to see (a) How many are marginally above the defined poverty line, and who could be vulnerable to the effects of external shocks such as floods or droughts and as a result end up below the NOK 1,000 poverty line.
- It would be of interest to know how many are how far below the NOK 1,000 poverty line before the project starts to take effect, because poverty could be significantly reduced even if no-one is lifted above the poverty line.

This clearly illustrates the need for relatively detailed income distribution and electricity access data for the population in poor areas in order to conduct meaningful poverty impact analysis that will be of value in policy assessments.

Obviously, if the recipient priority and donor willingness is present for undertaking more detailed mapping of impacts by stakeholder categories, one may disaggregate stakeholders further by gender, ethnicity, age groups, types of industry, etc in order to better capture the impacts on vulnerable stakeholders and develop compensatory/protective mechanisms.

The specific indicators to be monitored over time to trace stakeholder impacts along monetary and non-monetary dimensions is determined by the available budget and the patience and willingness of the recipient government's willingness to have such impact- and development information made public.

Table 9.4: Distribution of the NPV by Stakeholder Categories and poverty status*, (Million $$ in 2006 prices discounted at xx%).

Stakeholder category	Total economic value	Government stakeholder share	Households share*	Enterprises share*	Labour's share	Local communities' share
Total Benefits						
Total costs						
Net benefits (ENPV)						
Proportion* of ENPV going to Poor (PIR)						
ENPV to Poor						

*Data availability and quality along with project objectives will determine how detailed a disaggregation of stakeholders into different income/wealth categories is required. (several income quintiles and non-connected and connected households and enterprises).

Based on the above procedure to calculating the poverty impact, a Poverty Impact Ratio (PIR) can be estimated as the sum of ENPV to the poor divided by total ENVP for all stakeholders. However, the PIR is an indicator that can be rather misleading unless used with great care, as elaborated in S. Hansen and E. Kwon (2004). The PIR is a very data-sensitive variable. If it is significantly greater than the share of national income accruing to the poor, then the project in question should lead to decreased inequality. The magnitude of the poverty impact in a national or regional context depends of course on the size of the project relative to the national or regional economy. *What is being compared is the share of project net benefits to national income, and not to the share of the population below the poverty line*. It is quite possible to organize a project and policy setting so that it generates a PIR greater than one. This of course means that the non-poor will be net losers. They may therefore strongly oppose such a project design, because of its strong redistribution impact.

9.5 Methods for Measuring Indirect Project Impacts

If in appraisals and post-evaluation of projects it appears reasonable to assume that the project under investigation does not alter relative prices and that the use of shadow prices is sufficient under full employment conditions, then this can justify the exclusion of multiplier effects from consideration. However, when these conditions are clearly not met, as may well be the case with the introduction of large capital-intensive dams in relatively small and poor economies, multiplier impacts on output, income and employment can indeed be large and should not be ignored, as demonstrated in the four large dam cases referred to in Chapter 3.

In the case of institutional cooperation, such indirect effects may also be significant, especially if reform measures in the power sector represents a "turn-around" towards improved transparency, reduced corruption and red tape, and as a result an improved investment climate. Such an impact would then be felt economy-wide, and not just in the power sector, and that would mean that there is mutual endogeneity, i.e. that the reform improves the general investment climate, which again stimulates the economy, which again makes it more attractive for investors to consider this market both for power sector investments and power-dependent investments in industry, services and agriculture.

Furthermore, even if the basic benefit cost assumptions listed are valid, the regional and macroeconomic impacts of large projects such as large dams, may potentially have large consequences in terms of income distribution, spatial configuration of regional development, and non-economic impacts on regions other than the project area. By having available for use an analytic tool that can trace the key inter-linkages in the affected economy, the analysts may identify critical impacts and diagnose vulnerable stakeholders and resources that may need special consideration and protection in a wider planning perspective. Such diagnostic tracing may not be available when such economy-wide models are not available.

The perhaps most comprehensive recent documentation of how to analyze and estimate the long-term indirect effects and income distribution impacts of large dams (or large power projects more generally) is found in R.Bhatia et al (2005). The key methodological issues to be addressed are:

- The estimation of multipliers or other measures that reflect production-related and consumption-induced indirect economic (positive and negative) impacts of the project (e.g. a large dam),
- The assessment of income distribution and poverty reducing impacts, and
- The use of multipliers in ex-ante appraisal and ex-post evaluation of power projects

Multipliers are summary measures that measures the total effects of a project in relation to its direct effects. If a multiplier is 2.00 for example, it means that for every one NOK of value added generated directly by the project in long-term equilibrium, another NOK is generated in the form of indirect or downstream effects. In other words, the multiplier is the ratio of the total effects (direct plus indirect) of the project to its direct effects.

Estimation of multiplier effects of a project essentially involves quantification and valuation of major outputs of the project (e.g. a hydropower dam) and the assessment of the share of direct effects that is attributable to the project. Multiplier analysis is then used to estimate the outcomes of "with the project" and "without the project" scenarios. In the case of estimating the project multiplier value for a hydropower project such as a dam, then for the numerator,

one will need to estimate the regional value added under "with project" situation, as well as the regional value added under "without project" situation. For the denominator, one needs to estimate the value added from the sectors are directly affected by the major outputs of the dam projects (i.e. agricultural outputs, hydro-electricity, water supply, etc)

Depending on data availability, the following type of analytic economy-wide, multi-sector methods/models have been developed and applied to estimate the indirect and induced impacts, and (expect for I/O and S-I/O models) to perform income distributional and poverty reduction impacts of large infrastructure projects such as large dams..

1. Input-Output (I/O) and Semi-Input-Output (S-I/O) models,
2. Social Accounting Matrices (SAM)- based Multiplier Models,
3. Computable General Equilibrium (CGE) models

Input-Output (I/O) models

I/O analysis is a way of tracing the flow of production among the sectors on the economy, through the final domestic or export demand. The method is designed to capture the inter-linkages of production arising through the flow of intermediate goods and services among sectors. I/O models are based on an accounting framework that records all inter-industry flows at the chosen level of sectoral disaggregation, final demand, factor remuneration and total imports. A rigid assumption in such models when applied to economies undergoing rapid growth and structural change is that of fixed inter-industry linkage coefficients (including factor wages as fixed value added proportions of total gross output) which eliminates any substitution possibilities for producers.

Semi-Input-Output (S-I/O) models

S-I/O models are a variant of I/O models whereby a distinction is made between tradable and non-tradable goods. Output of tradeable goods and services is assumed fixed so that they can be assumed to have an exogenously set of total output and its portion sold locally/domestically. Thus any demand shock will affect only the exports. The implication of this distinction from an I/O model is that induced impacts reverberate throughout the economy only via adjustments in non-tradeables' output and their inter-industry linkages. This refines the representation of the regional structure of production and reduces the risk of over-estimating induced impacts when these are not felt by regional sectors or when tradeables have their output determined by existing supply constraints (R. Bhatia et al (2005), p.5. In the earlier chapters where the long-term and distributional impact of dams is discussed, this kind of model was used in the Brazilian case.

I/O and S-I/O models can be used to compare output, value added, and employment under "with dam" and "without dam" scenarios. Existence of a multiplier depends on drawing unused or underused resources into more productive economic activities, and these models produce multiplier estimates that only reflect the degree to which industrial sectors are linked with each other and the strength of such linkages. The results form I/O and S-I/O models do not include income distribution and poverty reducing impacts of the project.

SAM-based multiplier models

A SAM is an economy-wide data framework that represents the circular flow of income and expenditure in the economy of a nation or a region. These are different from I/O type models in that SAM explicitly traces the distribution of factor income to institutions and is thus able to account for the way in which initial asset distribution and factor endowments interact with

the structure of production in determining final outcomes. This capacity is also enhanced by the fact that SAMs generally comprise numerous household groups (e.g. poor and non-poor).SAM multiplier models have been applied by R. Bathia et al (2005) to estimate multiplier effects and distributional impacts on different household categories for two different dam projects in India, see the discussion in Chapter 3.2 and 3.5 above.

CGE-models

CGE models are designed for numerical solution. They provide a full account of production, consumption and trade in the modeled economy and explicitly adopts key economic behaviour assumptions of the actors (producers and households) in the economy. Such models have been widely used by e.g. the World Bank analysts on developing economies and has recently been applied to the long-term development and distributional impacts of Aswan High Dam discussed in Chapter 3. The standard CGE model follows the disaggregation of the SAM (see above) and explains all payments that are recorded in the SAM. A set of simultaneous equations (linear and non-linear) define the behaviour of the different actors in the economy, and the interaction with government sector as regards taxes and public expenditures, as well as reflecting constraining overall equilibrium system constraints at the macro-level. CGE models are used for so-called comparative static analyses, i.e. the impact in terms of the new equilibrium situation after an external shock (e.g. a large dam project) is compared to the pre-dam equilibrium. Each model solution provides an extensive set of economic indicators and can be used along with SAM-based models to compute "gains" and "losses" associated the the project for each category of household as these have been defined for the project being examined. For technical details and comparison of where these different models have their comparative strengths and relevance in appraisal and post-evaluation work, see R.Bhatia et al (2005, p.17).

Given the resources and time constraints, the selection of a suitable model for conducting multiplier analysis of a power project critically depends on the availability of I/O tables or SAM databases for the region in question.

9.6 Old Projects – New Directives: An Evaluation Challenge

Power sector projects take a long time to plan, pass through the decision-making process, organize and implement. The impacts of such projects begin to occur as early as at the project identification stage when rumors about a possible project begin to circulate the affected communities, and impacts may occur long after the project is completed. No wonder therefore that one and the same project may live through generational shifts in terms of how planners, decision makers, NGOs and affected parties view the effects and impacts of such projects. And indeed, the changes over the past three decades in how one assesses infrastructure projects in general, and power sector projects in particular, have been significant.

In the 1960s, cost/benefit analysis became accepted as the standard criterion for the justification of large dams and power supply projects. In the 1970s and 1980s, social and environmental impacts, previously treated as inevitable "side effects", emerged as fundamental concerns. For example, international guidelines and operational directives concerning resettlement impacts (a major concern in case of hydropower dams) were adopted in 1980 by the World Bank and subsequently by other aid agencies, while the first guidelines

on the environment were produced in 1986[24]. Corruption and governance issues were suppressed from the official aid dialogue with recipient governments until the mid 1990s.

Since the Norwegian power sector aid experience to be evaluated shall cover an extended time period, it would be of interest if the full evaluation would have as part of its mandate to find out if the projects and programmes would have "passed the exams" under newer guidelines, -standards and -directives regimes.

Such an evaluation exercise is clearly feasible, and was carried out by the World Bank's Operations Evaluation Department (OED) when it reviewed the Bank's experience with large dams in 1996 (Report No 15815: "The World Bank's experience with large dams – A preliminary review of impacts". August 15., 1996). This review assessed 50 Bank-financed large dams, most of which had been approved and come into being before the Bank adopted operational directives concerning resettlement and environmental assessments (corruption was not yet an official element of the dialogue between the Bank and its borrowers in 1996).

The reason this particular 10 year old review is presented here is that it took as point of departure available evaluation data and sought to classify the projects according to firstly, their economic justification (which was the only eligible criterion for evaluation at the time of these projects), and in addition, the evaluators classified the projects according to whether they had satisfied – or could have been planned and implemented so as to satisfy – not only the guidelines and directives prevailing at the time of approving the project, but also the new and stricter policy benchmarks (i.e. on resettlement and environment).

This 1996 evaluation report clearly showed the greatly enhanced protection provided by the new Bank policies to persons displaced as a results of dam construction. For example, the evaluation showed that while 90% of the dams reviewed met the Bank's standards applicable at the time they were approved, only about 25% were implemented so as to comply with the Bank's 1996 more demanding social and environmental criteria.

Equally interesting, the review also concluded that mitigation of the adverse social and environmental consequences of large dams would have been both feasible and economically justified in 74% of the cases, for details, see the above OED report of 1996.

While considerable care was given to secure the best available data, the Bank reported that the shortage of accurate, up-to-date information about costs, outputs, and social and environmental impacts, made it difficult to arrive at precise evaluations for many projects. This underlines an issue the coming full Norad evaluation will need to address, namely the need for adequate information from the earliest stage in the project cycle. **A large share of the uncertainty surrounding the impacts of power- and other infrastructure projects and programmes can be traced to the inadequacy of the available information about even the most basic social and environmental impacts. These impacts and the data and indicators required to monitor them should be addressed at the pre-feasibility stage, when the various alternatives to be compared are identified.**

Related to this is of course the (lack of) capacity and commitment of the recipient to cooperate to collect and monitor such comprehensive sets of data and indicators over an extended time period so as to make it possible to measure even long term impacts. The full

[24] Similar environment impact assessment (EIA) guidelines were developed for Norwegian development cooperation and approved by the Storting in Report No 186 (1986-87) to the Storting .

evaluation will need to look into to what extent such capacity and commitment in fact has been adequately addressed when deciding the amount of complementary technical assistance for recipient institution capacity building to enable it to implement the project/programme as designed and so that it's impacts can be traced and measured.

In all fairness, the Norwegian power sector aid cooperation should be evaluated against those guidelines and directives that were ruling the scenes at that the time projects and programmes were initiated and implemented, and not against those that have been introduced after the aid agreements went into effect. The last two decades have displayed an awakening awareness and acceptance of the economy-wide effects and impacts of infrastructure projects and sector reforms. A consequence of this has been a steady development in how the project and programme-specific social- and environmental effects shall be reflected in designs, appraisals and evaluations. Development agencies have responded by developing appraisal-, assessment- and evaluation methodologies that shall be able to take such effects into account in such ways that decision makers will know who are affected and how. This has direct consequences for the choice of indicators to be monitored from before the project/programme starts, throughout the implementation period, and during an agreed to be monitored post-completion period. The selection of such indicators has direct data collection implications, not only for the affected geographic area, but also for so-called control areas which have to be carefully selected in order to have a reliable baseline to test the project's/programme's development impacts against so that one may confidently speak about the value added of the action taken.

Having thus established how such an evaluation should ideally be carried out, it could nevertheless be of interest and of significant lessons from experience to try to test how projects designed, approved and implemented under an old set of guidelines and directives would have performed under a new and stricter set of guidelines and directives, e.g. as regards resettlement, distribution of costs and benefits among stakeholders, environmental impacts, and requirements as regards transparency and good governance.

9.7 The Evaluation Objective

The evaluation of Norwegian power sector assistance will be based on DACs quality standard and cover all of DACs criteria for evaluating development assistance; relevance, impact, effectiveness, efficiency and sustainability.

The main objective will be to document and assess to what extent Norwegian power sector assistance produced the anticipated results, identify successes and challenges, clarify reasons for why interventions have been successful or not, and lessons learned by Norway and partner countries/institutions. These assessments should include the result chain, cause/effects relationships and the importance of risks that are not easy to control or not under the control of the partners involved in power sector-related assistance. Results, in the form of lessons learned that have changed Norway's more recent assistance, should be verified and assessed, including changes in the main design of the interventions and actions for increasing results or reducing risks. In this respect, the evaluation will be backward looking and emphasise short term effectiveness, long term results, sustainability, reasons for success or failures and lessons learned.

The evaluation will, in addition, be forward looking and assess how the cooperation and results can be improved, with focus on measures under the control of Norway and partner countries/institutions. Therefore, the second objective is to identify strong and weak elements in the design of Norway's assistance and the planning/implementation instruments used by the Norwegian- and partner institutions. The instruments then include the realism and quality of project documents, analysis of the needs of the partner and the intervention logic (logframe), risks and impact assessments, assessments of the Norwegian and partner institutions competence and capacity, the monitoring and reporting systems, the integration of legal/ technical/ health/security/environment elements and follow-up processes.

The third objective of the evaluation is to contribute to a baseline for assessments of the performance and effects of the power sector assistance in the future. This information should be limited to key baseline elements. It shall cover both a relatively new partner country where Norway has decided to be involved during coming years, but also a baseline that documents the quality and results of Norwegian assistance among existing partner countries. The aim is to get a baseline at the beginning of the new action plan which covers the existing quality of the Norwegian input, the performance of the involved partners, the results achieved before or at the beginning of the implementation of the new action plan, and the context of the assistance.

9.8 The Scope; Key Questions to be Answered by the Evaluation

It is not possible to cover all issues of interest in depth. It is, therefore, necessary to choose a limited number of more specific questions. The evaluation team should investigate and assess the following key questions, and present the findings, conclusions, recommendations and lessons learned in the draft- and final report. The evaluation team is free to propose additional or reformulated evaluation questions or changes in design/methods in its tender documents and the inception report.

Key evaluation questions are:

1. What have been the results of Norwegian assistance to the partner country, its power sector, institutions and participating staff, and for the Norwegian stakeholders?

The result-concept then covers anticipated and unexpected results, short- and long-term effects of the assistance on output, outcome and impact level, the cause-effect relationships and risk-factors. Analysis should at minimum cover capacity/competence building effects for institutions and individuals, effects on resource and environmental management, economic impact/sustainability on country/institutional level and, if possible, the contribution to poverty reduction. Assessments of institutional development and capacity should preferably be in accordance with EU or equivalent guidelines[25].

The evaluation should especially investigate the results of long-term assistance in the form of advice and training. It should try to clarify whether assistance needs to be substantial before the results are significant. Do the results, for example, increase substantially if the assistance is great and long lasting as in Mozambique?

[25] European Commission. Europe Aid. September 2005. Institutional Assessment and capacity Development. Why, what and how? See also guidelines from Danida or DiFD

The analysis of results for the Norwegian stakeholders should cover both the Norwegian institutions and companies directly involved in the partnerships, and also clarify the economic linkages to institutions, companies or individual consultants in other steps in the results-chain.

The evaluation should, in addition, identify the main internal and external risks influencing the results and performance of Norwegian power sector assistance so far, and how threats/risks were analysed, monitored, reported and reacted to. The response of assistance authorities or partners to weaknesses and potential improvements that are reported in reviews, progress reports or other documents will be of special interest.

2. The content and quality of Norwegian power sector assistance (the input), with emphasis on: The quality of input when assessed for its relevance for the partner countries/institutions/staff, using guidelines for Norwegian development assistance and internationally accepted quality standards related to assistance or the power sector.

The evaluation should give a clear description of the Norwegian intervention (time pattern, volume, content, actors and context, including relationships to other relevant interventions). The quality assessments of the inputs should focus on the effectiveness, efficiency and capacity of the Norwegian partner institutions, but also include the competence of their staff and partners in development assistance, transfer of knowledge, language and cultural skills. In other words: How has the capacity/competence/quality of assistance been among the different Norwegian partners and subcontractors, including Norad, MFA and the involved embassy? How cost-effective has their assistance been and to what degree have they reached the expected goal stated in agreements and annual plans/budgets? How has the quality of programme design and planning affected implementation and result?

The relevance-concept should cover how relevant Norwegian role models and instruments/measures have been when implemented in partner countries. Role models include ways of organising responsibility for policy development and implementation (law, regulations, licensing) and the choice between twinning arrangements between institutions or hiring consultants for more focused “task-assistance”. The instrument concept includes such tools as programme assistance planning, assessments of partner needs (including training needs), environmental/social impact assessments (when relevant)), and quality/performance control. Quality/performance control refers to tools used before a programme is entered into by Norad or agreement partners, appraisals by resource persons, and tools such as monitoring, reviews and evaluations. The effects of appraisals, monitoring and reviews on implementation should also be clarified to see if recommendations have been included in projects afterwards.

The evaluation should also clarify to what degree cross-cutting issues have been covered in power sector assistance such as health, safety, environmental protection, good governance, gender and capacity building/training issues. Such a limited study of the cross-cutting realities should be compared with existing data sources including Norad’s statistical database, reviews and reports from the involved embassies to assess the quality of existing information tools.

Another issue of importance is the complementarity or synergy between different types of infrastructure, such as provision of power, telecommunications and roads to an area that has previously been unserved by these infrastructure services, and selected areas where one or two of these infrastructures have been in place, and the second or third one has been added. In other words, has the productivity and impacts of e.g. a road been enhanced as a result of the area it connects to the wider society has received electrification?

Assessments of contents and quality should be based on the guidelines which were relevant at the time of the Norwegian assistance; including framework agreements, contract obligations and ToR, in addition to quality or normative standards for the power sector, and policy documents by Norwegian and partner country authorities.

3. What have been the successes and challenges in the relationships between Norway and partner countries/institutions, and with other donors or commercial actors?

Relationships refer to partners on different levels (national and institutional), in different sectors (public/commercial and power/conflicting water uses/environment) and during the main phases of assistance (planning, implementation and exit).

The evaluation should especially investigate and assess:

- challenges in the internal relationships and cooperation between Norwegian partners in the assistance
- the challenges and opportunities for Norwegian assistance when commercial interests and other foreign authorities (both bilateral and multilateral) have been involved directly or indirectly.
- the preconditions and capacity to absorb assistance in partner institutions; how has this been analysed and what have been the main problems and solutions? How have these and other challenges been handled in dialogues connected with the planning, annual dialogs/meetings and reporting activities?
- What have been the experiences with alternative models for project management, with emphasis on resident and non-resident locations of management?
- What have been the experiences with the main alternative types of training both in Norway and partner countries?

9.9 Methodology and Data Sources

The evaluation should be based on a case-study design and build on information produced by earlier reviews, appraisals or study reports, but use such second-hand accounts as a starting point for analysis of first-hand empirical material which gives a deeper or broader understanding.

For the purpose of establishing genuine impacts, counterfactual analysis should be applied as far as possible. However, as this State of the Art review has shown, very little thinking about carefully established counterfactual analysis and choice of variables (indicators) followed up by data collection fitting the ex ante impact analytic format has taken place in Norwegian power sector assistance.

In the evaluation such lack of crucial baseline data for project areas (communities, regions or countries) and control areas, shall be sought compensated for by means of international studies and survey data produced by others, e.g. World Bank LSMS and DHS surveys over time, and various census information as described in the State of the Art review. An important part of the full evaluation will then be to assess where and when and under what circumstances knowledge and understanding about causal linkages and effects can be transferable from non-Norwegian power sector activities in country to Norwegian activities as a basis for evaluation conclusions and recommendations.

The large and long lasting Norwegian programmes in Mozambique and Tanzania would be candidate base cases since these two countries have received 20% and 17% of the total power sector aid during then past 25 years. One or two base cases should be assessed by a comprehensive and in depth field study of the above mentioned key evaluation questions including the quality of Norwegian assistance, the relationships with partners and the intended and real results for the stakeholders in country(ies) in question, the related region and in Norway. This in depth study should cover Norwegian assistance from its start and up to summer 2006. The emphasis should be on long-term effects (more than 5 years), but also cover recent short term effects of strategic importance.

Results from the case study(ies) will be compared with and supplemented by more limited case studies in a few other countries, looking for general patterns or dissimilarities in the results, the quality of Norwegian assistance and the relationships with partners[26]. The comparisons will include information published in the state-of- the-art report, new reviews of the power sector assistance to other partner countries or other documents from selected partner countries[27].

In theory, the expected results from Norwegian assistance in general will depend on the involved Norwegian resources (volume, quality and duration), the relationships with partners and their capacity/competence, and the context of the assistance. Important contextual elements in power sector-related assistance are the partner country's situation as a developing country and producer of electricity, if Norway is a small/large actor, the relationship to other interests etc. The choice of additional case-study countries is based on the need to cover experiences from countries where the scope and volume of Norwegian assistance has varied, and where the contexts are different.

In addition to the field study in one or two case study countries, three limited field studies will cover Norwegian assistance to countries where the power sector assistance has been provided in different economic, social and political settings. Two of these countries should be in low-income Asia. All of these field studies should cover content and quality of the Norwegian assistance and the results of training activities in Norway for the participants. The collection of new data on the results on capacity and competence building for the involved institutions is limited to the selected case study country (ies) and these additional brief field study countries. The additional data collection on results will vary depending on what sort of data to document impacts are available from Norwegian assistance and other sources.

It should be possible to collect information on the content and quality of Norwegian assistance by interviewing resource personnel in the Norwegian institutions and agencies who have been involved in the chosen case-study countries and by analysing existing documents and accounting data. These data sources should also give reliable information on results for

[26] The evaluation design is in other words a "multiple case study design with embedded multiple units of analysis"[26] as described for example in Yin, R. K. 1984. Case Study Research. Design and Methods. Sage publications. London. The Norwegian power sector assistance programmes in a few selected countries will be "the multiple cases" and the units of analysis are the results, quality of inputs and relationships (the key evaluation questions). The main method is to compare – when possible - how the analytical unit(s) varies between chosen cases (countries and interventions) and contexts, looking for similarities and diversity

[27] Supplementary information on some results from Norwegian power sector assistance will also be found in an evaluation of Norad Fellowship Programme from Tanzania and Bangladesh, see Norad 2005. Evaluation of the Norad Fellowship Programme. Evaluation Report 1/2005. Oslo.

the involved Norwegian stakeholders, either directly involved or indirectly through other steps in the result-chain. It will be important to compare the Norwegian actor's self-assessment with quality assessments by partner institutions, their staff and other relevant actors inside the power sector or in related institutions.

Information about the results in partner countries/ institutions and other donors should be available from the same type of resources; by interviewing people on all staff levels and units in the partner institutions, and through data produced by them, including accounting data. It is, however, important to first clarify the products and services that the partner institutions have delivered by collecting information from the users of such products and services, both inside and outside of the power sector (for example from other ministries and the private sector). Data on long and short term effects of competence building and training should be collected by interviewing the participants who have had training in Norway[28] and on courses/job-training in partner countries. The training data should include previous staff members who have changed jobs. The data collection in partner countries is a demanding task and requires most probably aid from competent local consultants.

It is necessary for the evaluation team to use triangulation strategies and check the reliability of information by comparing data from different sources. The comprehensive study in the primary case study country(ies) e.g. Mozambique and/or Tanzania, and the additional field studies in e.g. Nepal, Uganda and Laos, should include comparable personal interviews of the staff that cover all levels and units in partner institutions. These field studies should present an overview of all actors involved directly in the partnerships, but also other actors who have been participating/hired in additional steps of the result-chain including institutions, companies and individual consultants in Norway and partner countries.

The consultants should, in their tender document and inception report, clarify the analytical tools and data collection methods they intend to use for the assessment of results and performances. The quality of design, analytical framework and data collection methodology proposed by the consultants in their tender will be one of the criteria for selecting the evaluation team.

9.10 Reporting

The consultants will present an inception report within 4-5 weeks after the contract is signed giving a more detailed plan for the work tasks. An important purpose of the inception report is to clarify the analytical framework, the main hypothesis which the evaluation will investigate, data sources and indicators. The indicators should be as specific, measurable, attainable, relevant and time bound (SMART) as possible. The inception report will be based on desk review of documents, interviews with key resource people and include a preliminary discussion of the intervention logic (the relationship between the power sector assistance program and expected results) and the assumptions which the interventions were based on. The inception report will be discussed with the team and members of the reference group at a meeting in Norway before approval by EVAL.

[28] NVE, ICH, NTNU and the involved consulting firms and contractors can make available lists of all participants on their different courses, and on the job training in Norway and elsewhere outside the resident country of the participant.

The field studies will end with a debriefing of the Norwegian Embassy(ies) and involved partners before leaving the case-study country and with a debriefing of Norad and relevant stakeholders at a meeting in Norway.

A draft final report will be delivered in electronic form before an agreed date for feedback from EVAL, the reference group and other stakeholders involved. The feedback will include comments on facts, conclusions, recommendations and lessons learned. The consultants should reflect these comments and acknowledge any substantive disagreements in the final report.

The final evaluation report is to be submitted to EVAL by the Team Leader 3 weeks after receiving the comments from the various stakeholders via Norad. It shall be an analytical report written in English not exceeding 60 pages (excluding annexes), detailing the findings, conclusions and recommendations on planning and implementation for Norwegian power sector assistance in the coming years. The structure of the report should facilitate assessments of the key evaluation questions. Annexes should give more detailed information on Norwegian assistance to each case-study country; the assistance, context, results, quality, relationships and methods used in the evaluation. The final report shall be delivered both in electronic and paper form in accordance with EVAL's guidelines, and the language checked.

The final report will be followed-up by meetings/workshops where the consultants will participate in discussions with the parties involved, other stakeholders and with EVAL. The follow-up phase for the consultants will be limited to 15 man days during the 6 weeks after the final report has been delivered.

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APPENDIX 1: TERMS OF REFERENCE: STATE OF THE ART STUDY: THE LONG-TERM EFFECTS OF ASSISTANCE TO THE POWER SECTOR

INTRODUCTION AND BACKGROUND.

The State of the art study is an input to a forthcoming evaluation of effects of Norwegian assistance to the power sector, which includes not only hydropower but other forms of energy (except oil and gas). Assistance in the power sector covers energy policy, planning and management/administration of power supply and transmitting/distribution, energy and water resource related studies, and the development/operations of energy facilities,. The state of the art study will identify and assess issues where more insights are needed and their evaluability.

Norway has been engaged for many years in cooperation in the power sector, having used more than 10 billion NOK in total during the last 25 years. The cooperation has included more than 70 countries and a broad cross-section of the sector. Establishing competence and capacity for government entities to strengthen their role in management of the sector, and developing infrastructure has been important issues.

Important partners on the Norwegian side have been The Norwegian Water Resources and Energy Directorate (NVE) and other public institutions together with a number of consultants and companies that have been involved.

A working group established by the Ministry of Foreign Affairs has now proposed a strategy and actions for significant increased cooperation in the power sector, with emphasis on the contribution to economic development and reduction of poverty. Building of institutional competence and capacity, and good governance will be key issues also in the new activities, in addition to due consideration of environmental and social impacts.

Norad intends to perform a comprehensive, but focused evaluation of the Norwegian cooperation in the sector up to now. An important objective will be identification and documentation of the results of Norwegian aid in the power sector, and especially of the long-term effects. The emphasis on long-term impacts are partly based on the fact that planning and implementation of power developments most often are long-term activities, and that important economical, social and environmental impacts will also last for a long time. But many impacts will probably also be visible only long after the development has been finished because of long cause and effect chains. There is very little knowledge about the long-term effects to base policy and guidelines on, and a clear need for better documentation of the results.

PURPOSE

This state of the art study is limited to assistance in the power development sector and water resource management. The main purpose is to identify and assess which evaluation questions the coming evaluation should focus on and their evaluability, by:

- synthesising findings in earlier reviews of the Norwegian assistance to the power sector and recently published international reports,
- assessing the Norwegian experiences gained and results achieved.

- identify issues where information on effects is needed, and strengths/weaknesses in the existing monitoring and impact assessment system (including the availability of data),

By scrutinizing and summarizing the experiences and results documented in existing review- and evaluation reports, it will be easier to decide which issues will be most important in the following evaluation. The state of the art study will especially look for the influence on communities, institutions, industries, households and the environment by power development itself, the distribution net, energy use and supply conditions, and also water resource planning and management.

OBJECTIVES AND SCOPE OF WORK

The objectives of this study are to establish a state of the art report on the effects of such assistance, and the quality of impact assessment reports/systems and data, by:

- syntheses findings in earlier reviews of the Norwegian assistance to this sector and in recent international evaluations/studies, including direct/indirect and short/long-term effects on local, national and regional level, and synergetic effects with other infrastructure developments
- assessing the quality of Norwegian review/end-reports and the Norwegian assistance in this sector according to relevance, effectiveness, efficiency, impact and sustainability.
- assessing recent international experiences with establishing systems and indicators for documenting impacts from infrastructure projects and propose indicators that can be introduced in a Norwegian impact monitoring system
- identifying issues where information on effects is needed and assessing the evaluability, especially the availability of (baseline) data from projects aided by with Norway.

The State of the art study shall include the following:

i. an overview of the Norwegian assistance: including;

- An assessment of strengths and weaknesses in the Norwegian assistance which have been identified by a sample of review reports and resource persons with focus on
  - the design and implementation of the cooperation agreements
  - the capacity building and institutional strengthening as integrated component in the cooperation
  - the transfer of knowledge
  - the establishment of administrative structure, legal systems and institutional tools, including impact assessment systems and regulations.

- A description and assessment of the quality of 10-15 Norwegian reviews of the assistance to the power sector, including a short overview of to what extent output, outcome, impacts and cross-cutting issues have been analysed and the types of data sources used.

ii. an overview of recent international experiences documented in evaluation and research studies and reports after the World Commission on Dams had completed their work, especially studies from the World Bank, Asian Development Bank and other aid agencies as Sida. An important issue is the experiences ADB has with the impact assessment system and indicators used after 1999 in another infrastructure sector.

iii. An identification of issues where information is needed, and an assessment of the

evaluability according to available data.

iv. The final report shall in addition include draft terms of reference (ToR) for the evaluation study

WORK PLAN / METHODOLOGY

The review will consists of a desk study based on existing information and discussions with Norad, the Norwegian Water Resources and Energy Directorate (NVE) and Norwegian partner institutions, and some of the consultants responsible for the reviews that will be scrutinized. The most efficient way of getting information on recent international experiences will probably be by getting an overview of relevant reports/studies with help from Norad's library, and a short visit to a leading knowledge centre (which probably is one of the main development banks).

The selection of Norwegian reviews and documents will be done in cooperation with Norad's resource persons. The objective is to get a broad picture and sample of the total population of Norwegian aid activities in this sector the last 25-30 years, with priority to activities that will be relevant for aid in the coming years. Norad's statistical database will be used in the selection process to present an overview of this type of aid.

The consultant will review these terms of reference and discuss the approach to the task with Norad at an early stage. The discussion will be based on a short inception report which also will assess alternative competence centre that are relevant for a visit, and the quality indicators to be used in the description of the Norwegian assistance so fare. Attached is a list of key questions or indicators that may be used.

TIME FRAME, REPORTING AND BUDGET

The works shall take place winter 2006 with an inception report delivered before April 18th, based partly on a systematic literature search of relevant reports/studies delivered by Norad's library on January 10th. A draft final report is presented to Norad before 17 th of June 2006, and the final report before end of June. The reports will be in English language. The inception and draft final report will be in electronic form. The final report will be in electronic form (language washed), and as three printed copies. The final report will be not more than 30 pages, with an additional short summary and the necessary appendixes.

The total budget will be 325 000. - NOK. The budget for salary will be 275 000.-, based on the estimated need for 340 man-hours a 825.-, plus 50 000. - for travel expenses, per diem and other expenses.

The framework agreements that Norad have with major consultants will be used to hire a person/team that has strong and documented experience from evaluating impacts from power developments, and the International Banking sector.

Norad, The Evaluation department
Oslo 20 January 2005

ATTACHMENT:

Key review questions or indicators may be used in assessing reviews/reports/documents:

- Did the reviews/reports/study/document identify or describe short- or long-term effects/impacts from the power development itself, the distribution net, how the energy has been used and/or the supply conditions
- Did the review/study describe the assistance/intervention or input (purpose and content of work, time frame, economical volume, personnel resources and qualification)?
- Did the reviews document output and results (on outcome or impact level?), including capacity building, institutional strengthening, and transfer of knowledge?
- Did the reviews describe and analyze how the needs of the receiving country and institution were identified and analyzed?
- Did the review assess the quality of Project document and appraisal, based on DAC's criteria?
- Did the reviews describe and relate the Norwegian assistance to the local context in the receiving country and institutions (phase of economical development, legal and political situation, receiving capacity, alternative donors, interaction with other interventions for example in the infrastructure sector)?
- Did the reviews analyze cross cutting issues as corruption, human rights, HIV/aid, impacts on the environment?
- What type of information sources were the reviews based on (Project documents, appraisal-documents, interviews with resource persons, fieldtrips), and were the data quality (relevance and reliability) assessed?

APPENDIX 2: MEETINGS/PHONE INTERVIEWS IN WASHINGTON DC, 19 – 25 MARCH 2006

Date/time	Institution	Person	Contact details
20/03 - 0930	World Bank, ESMAP	A. Covindassamy	acovindassamy@worldbank.org
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" 1800	Former WB ENV Chief	J. J. Warford	jeremywarford@cs.com
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" 1400	Global Env Facility	J. Haarstad	
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