REDEO - Rural Electrification Decentralised Energy Options
Newsletter n° 2

Supported by the ACE through the EC – ASEAN Energy Facility

Rural Electrification Decentralised Energy Options

in Cambodia, Lao PDR and Vietnam
Under the framework of the Initiative for Asean Integration Project

Introduction

The REDEO project is founded on the observation that most of power sector planning tools address main interconnected networks and their expansion. Those which address more local issues – and renewables in particular, are generally limited to techno economic analysis or very local distribution planning – and are in all cases limited to electrification issues. Further, it is now becoming clear that in order to achieve maximum impact, rural – or local – electrification must be viewed in a holistic context of local development dynamics, including other related infrastructure (health, education, telecommunications, …) and related sectors – agricultural, cottage industries, …

REDEOs main objective is to provide planners of rural electrification (RE) with a set of flexible and computerised decision aid tools for integrating sustainable and off-grid distributed generation options in planning for rural electrification. The proposed approach is cross sectoral in essence and uses the support of Geographical Information Systems (GIS). The first three countries for testing, developing and implementing the approach are Cambodia, Laos and Vietnam (CLV).

Past activities

Since its beginning in June 2003, various activities were undertaken under the framework of the REDEO project:

- Organization of a kick-off meeting with institutions in charge of Rural Electrification in the target countries.
- Assessment of existing software programs and areas of application for Rural Electrification in CLV
- Design of a global REDEO methodology for Rural Electrification Planning at a provincial level in CLV countries
- In country evaluation of existing software programs for Rural Electrification Planning and assessment of needed development
- Development of a preliminary version of a GIS-based decision-aid tool for REP.
- Data collection[1] for 3 case studies in the following provinces: Kampong Speu in Cambodia, Oudomxay in Lao PDR, and L.ao Cai in Vietnam.

First results

The key results of the REDEO project so far, are as follows:

Three very specific Rural Electrification Frameworks

Missions to target countries during May to July 2004 confirmed the findings of the kick-off meeting that Rural Electrification Frameworks in the three target countries are very different from each other.

[1] This data collection has only been done at a national level in each of the three target countries. In order to be able to conduct full study cases, data at provincial levels are needed.

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The electrification rate in *Cambodia*, where there is no existing interconnected grid, is very low, with only about 7-10% of the rural population (i.e. 85% of the total population) having access to electricity. Presently Cambodia has no national grid, but only 22 local distribution systems fed by isolated generating systems. Cambodia would like to develop in the coming years a Rural Electrification Master Plan mobilizing in a relevant manner the plentiful natural resources of the country, namely, biomass and mini hydropower.

Lao PDR has already designed a Power Development Plan for electrification of localities for which a connection to the grid is technically feasible. Lao PDR is now interested to design a complete Rural Electrification Master Plan with off-grid solutions for the population far from the grid. Even if some projects have already (or are) been conducted to implement such options, there is a need to compare the various options for a given area, in order to identify and evaluate how natural (namely hydro) resources can be tapped.

Vietnam has now attained a relatively high electrification rate (about 60%) and the national grid is quite well developed, and grid extension remains the first considered option for electrification. However, for populations in remote areas, off-grid options need to be considered to and the large renewable energy potential (namely for hydroelectricity / biomass) could be mobilised for this. Assessment of relevance of decentralized options for rural electrification is now an important issue for Vietnam.

Incipient GIS capacities to be strengthened

Institutions in charge of Electrification Planning in the three target countries are already using GIS software programs. In most cases, one or several people of the institution is (are) trying to develop progressively a GIS for Rural Electrification Monitoring. They, however, often do not have any educational background on GIS. Some capacity building programmes would therefore need to be put in place to support these local initiatives.

GIS database structuring as the first basic need

A full and well-structured GIS database for Rural Electrification is often not yet in place in the target countries (especially in Cambodia and Lao PDR). This is however the basic need of planning institutions in the target countries.
These databases must be built upon three main types of data sources:

- Data for national census, when they are available, are often the most complete and accurate data to be gathered at a national level. Cambodia has, for instance, completed a population census in 1998 and is now delivering the full results as databases on CDs.
- Other existing data at national level: collaborations with other national institutions must be developed by Electrification Planning Institutions. Ministries of Roads, Agriculture, Health, Education, etc… are often compiling databases on existing and planned infrastructures for the whole country, and this data are more and more structured in GIS databases.

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- Existing data at provincial (or other decentralized) level: When needed data for Rural Electrification Planning are not available at national level, data collection at decentralized (such as provincial) levels have to be arranged. This is more and more important in countries with a high level of decentralization, such as Vietnam.

These databases must then be completed with energy-related data, such as:

- Data on existing and planned electric infrastructures (namely grid lines)
- Data on renewable energy resources and potential
- Characteristics and costs of available technologies for electricity production, transport and distribution.

These two last data sets are often time-consuming, since information and data for them are generally dispersed and not structured.

REDEO 1.0: a first GIS-based decision-aid tool for Rural Electrification Planning in ASEAN member countries

A first version (1.0) of the REDEO's final tool, having a part of the functionalities required at the end of the project, has already been developed. The main objective of this first version was to give a basis for further developing and to produce some early results in order to show the potentialities of the GIS software for the accomplishment of the project's goals.

The tool consists of a toolbar that is automatically created each time Manifold starts, and which gives the user some additional functionalities compared to the basic Manifold software.
The current implemented functionalities are as follows:

Data importing

Input data of REDEO 1.0 are structured in 6 GIS layers ("drawings"), and 2 tables.

The needed layers are:

- A background drawing showing, for instance, the administrative boundaries of the considered province, or other data on the "environment" of the project: rivers, mountains, roads, ….
- Four drawings with potential "electricity availability points"' for each considered electricity source : diesel gensets, biomass installations, hydropower turbines, and connexion points of the existing grid. Behind each of these "electricity availability points", data are included, such as total available power and energy, investment costs, operation and maintenance costs, ….
- A drawing with the location and characteristics of load points (i.e. villages or group of several villages)

Tables on available technologies for electricity production needed to be imported (from Excel type worksheets) for diesel and biomass installations.

All these input data need to have a given structure (columns' names and types, …) for the application to work properly.

Production options selection (localization and technology)

The application allows the user to work only with some "electricity availability points" of the imported drawings. This functionality is interesting to a planner who would like to do some simulations on the use of various production options.

For each potential production site, the application allows the user to choose:

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- For diesel and biomass electricity production, the model of the machine to be used in a determined point of production
- For hydropower production, the power capacity to be installed in a determined point of production.

Global network design:

In this first version, no technical-economic comparison of various options for rural electrification is programmed.
The application allows, therefore, the user to evaluate the (investment and operating) costs of the shorter network connecting all the selected production sites, existing connexion points on the network and load points. These costs are then reported to the user.

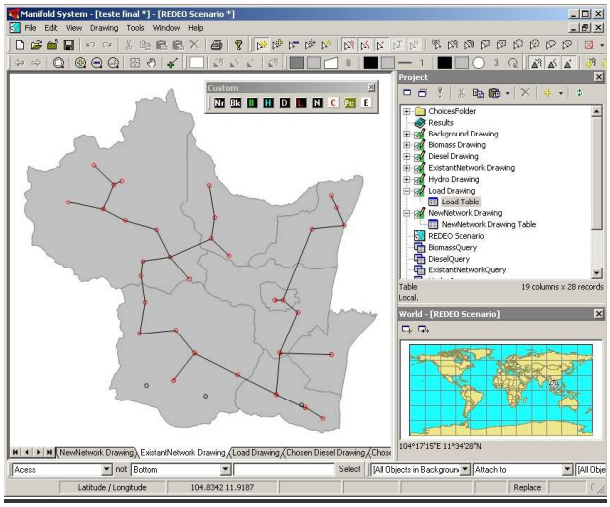

Figure 1: The REDEO 1.0 Tool

Based on this first version, the REDEO project team is now writing the final specifications of the REDEO tool to be developed in the framework of the project. This tool will support the planner in CLV countries to follow the REDEO methodology for Rural Electrification Planning at a provincial level, illustrated in figure 2:

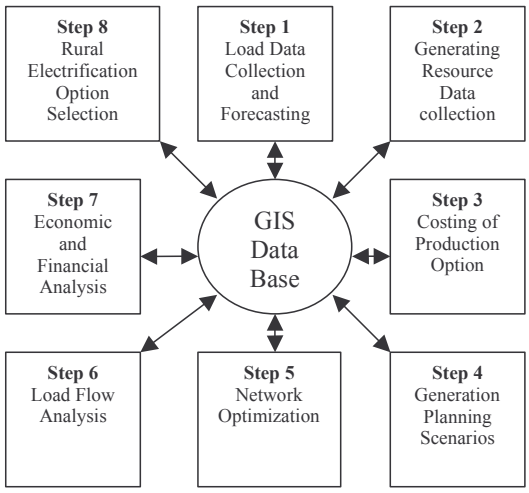

Figure 2: The REDEO Methodology

Next phases of the project

September – December 2004:

- Final specifications of the REDEO GIS tool.
- Development of beta version of REDEO
- Writing of a synthesis report on existing software programmes and approaches on Rural Electrification Planning
- Reporting on Rural Electrification Framework in CLV countries
- Discussion by the project team during an internal meeting in December 2004.

January – May 2005:

- Development of the final version of REDEO
- Test of the final version on selected case studies (One province in each of the three target countries)
- Organization of discussion workshops on Rural Electrification Planning between ASEAN member countries

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- Project promotion and dissemination, through publication of papers and newsletters.
- Writing the final report.

Project team:

The REDEO project is led by the French engineering and consulting firm IED (Innovation Energy Development), with two partners: the Energy Field of Study of the Asian Institute of Technology (AIT) and the Energetics Center (CENERG) of the French Research Centres Association ARMINES (Association pour la Recherche et le Développement des Méthodes et Processus Industriels).

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