

Basic infrastructure projects in rural areas of Guatemala

Evaluation of the construction management process of small-scale projects built at the rural areas

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Summary

A lot of basic infrastructure projects are being built in the rural area of Guatemala. The target groups are communities living in extremely poor conditions at the rural areas. Projects such as: buildings for educational and health purposes, water supply and irrigation systems, basic drainage and sewage systems, small bridges and basic road access are among others the most urgent needs to solve for people living at the rural areas of Guatemala.

Guatemalan government is making a lot of efforts in order to build as much as it is possible basic infrastructure all over the country. Therefore, several governmental and non-governmental institutions have been created in order to work with the rural area groups all over the country.

FIS (Social Investment Fund), is one of the most successful organizations of its kind. FIS is supporting the rural area's groups all over the country. Therefore, since a consultant engineer's point of view of this organization, this paper will present experiences of projects that have been constructed in the lately five years.

This paper will describe the project planning process of basic infrastructure projects in rural areas. It exposes the type and size of the projects. It also describes how the projects are managed by internal staff member of a non-governmental organisation from inception to the delivering stage of the project to the target group.

However, after several years of building community projects, some outlets might be implemented for future projects for the rural area's groups.

Specific problems in all community groups have surged due to the variety of the projects. This issue, points some of the difficulties found when constructing the projects on site. Solution seems hard to find due to different cultural, social, geographical and economical situations of the target groups.

By, describing the whole process since selection of the project to conception. The paper would lead to realize that difficulties might be solved, in the early briefing design stage. Some others would be fixed with an

appropriated project planning. Through the construction process, by controlling quantity and quality of materials would guarantee the success of the project.

Therefore, by intensifying property management aspects in every stage of the project, this paper shows that planning management would solve most of the problems we could find in basic infrastructure projects at the rural areas of Guatemala.

Introduction

It is well known, that after finished the internal civil war in Guatemala, the rural area's people, caught in the cross of fire of politics, had suffered at hands of government and guerilla alike. If it would not been enough, the recently, tragic destruction caused hurricane Mitch, increased the lack of infrastructure at the rural area's groups.

Basic infrastructure projects are urgent to build in rural areas of Guatemala. In order to increase the standard living conditions of the communities all over the country, infrastructure projects must be well designed, planned and constructed.

Different social, cultural, economical and geographical locations of the rural area's groups; seems to become the task of planning difficult to success. Due to the variety of the projects, different obstacles would appear from one type to another.

The aim of this paper is to present and describe the experience of the process of construction of basic infrastructure projects at the rural areas of Guatemala. Several stages of the project will be described. Planning activities, such as: selection of the target groups, selection of the type and size of the project, construction process and the final delivering to the community will be analysed.

Some lessons, learned from the present experience would be useful to the actors (public and private sectors) involved in the construction process of future projects at the rural areas of Guatemala. Instead of building

infrastructure projects for short-term gain, construction property management at the community projects would yield long-term benefits at the communities living at the rural area. By using construction property management, these projects would progressively lead the country to an effective process of development.

Facts

Guatemala has nearly 10 million inhabitants living in an area of 108,889 square kilometres. Most of the 70% of its population live in rural areas. Guatemala is facing urgent challenges in order to raise the standard of living for all Guatemalans

Projects such as roads, water and sanitary systems, low-income housing, as well as health and education buildings are urgent to build in order to provide a better well being for the greatest number of poor people. However, property management for these projects is a must for the entire private, governmental and non-governmental sector involved in this construction process.

Political, economical, cultural and geographical conditions

Rural areas in Guatemala are spread all over 22 departments, which function like states or provinces. Every department is divided in towns. Rural area is described as any community settled out of towns.

In order to attend and to point similar geographic, cultural and economic characteristics Guatemala it's divided into eighth regions. In these regions are located the target groups all over the rural areas in the country.

Most of the inhabitants of the rural areas are native descendants of the pre-Columbian Maya. Some other minority groups living at the rural areas are primarily Hispanic. The official religion is Catholicism. Protestant and Evangelical have become in recent years the second religion of Guatemala.

The majority of the people living at rural areas are low-income people. The main economical resource of these groups comes from working the land they live in an agriculture basis. Guatemala's economy is basis on agriculture and 50% of laborers still work in the field. Most cultivate small-to-medium plots of land, and then head to the pacific coast during the seasonal harvesting of the large agro-export products: coffee, sugar cane, cotton, fruit and vegetable.

Region I: Guatemala

Guatemala City, founded in 1776, is the centre of the cultural, political and commercial activities of the country. The city lies in a valley surrounded by mountains and volcanoes. Guatemala city has a population over two million and an elevation of 4,921 feet with an average temperature of 59-78 F and an annual rainfall of 50 inches.

Traditional agriculture products: Broccoli, cut flowers, corn, coffee, carrots, and apples.

Agricultural products with growth potential: Snow peas, cut flowers, and bromelads.

Mineral outcrops in the region: Antimony, barium, zinc, iron, and manganese.

Principal Industries: Light manufacturing, food, processing, beverage bottling plants, retail, textile and clothing assemblage plants (drawback), and agroindustry.

Region II: Central Highlands

Three departments conform this group: Chimaltenango, Sacatepequez and Solola. The population of this area is near to one million inhabitants. The elevation goes from 5,020 to 6,936 feet; the average temperature is 56-74 °F and an annual rainfall of 38-63 inches. Access: primarily the inter-American Highway accesses the region.

Traditional agriculture products: Coffee, cut flowers, corn, baby vegetables and fruit.

Agricultural products with growth potential: Okra, melon and Garlic.

Mineral outcrops in the region: Antimony, iron, titanium, and copper.

Region III: Western Highlands

Departments: Quetzaltenango, Totonicapan, San Marcos and Huehuetenango. Population: 2.3 million inhabitants. Elevation: 6240-8186 feet Average temperature: 54-65 °F Access: The inter-American highway runs through most of the region.

Traditional agriculture products: Weath, corn, coffee, carrots, and apples.

Agricultural products with growth potential: Snow peas, cut flowers, and bromelads.

Mineral outcrops in the region: Antimony, barium, zinc, iron, and manganese.

Region IV: Northern Highlands

Departments: Quiche, Alta Verapaz y Baja Verapaz. Population: 1.5 million inhabitants. Elevation: 3084--6630 feet. Average temperature: 61-72 °F.

Traditional agriculture products: Corn, coffee, fruits and sheeps.

Agricultural products with growth potential: Broccoli, and forest products..

Mineral outcrops in the region: Magnesium, cronite and titanium.

Region V: El Peten

Departments: El Peten. Population: 391,435 inhabitants. Elevation: 427 feet. Average temperature: 72-86 °F. Traditional agriculture products: Broccoli, cut flowers, corn, coffee, carrots, and apples.

Agricultural products with growth potential: Corn, rice, and black beans.

Mineral outcrops in the region: Copper.

Region VI: Izabal

Departments: Izabal. Population: 450000. Elevation: 5 feet over sea level. Average temperature: 70 °F.

Traditional agriculture products: Bananas, corn, black beans, rice, plantains and fruit.

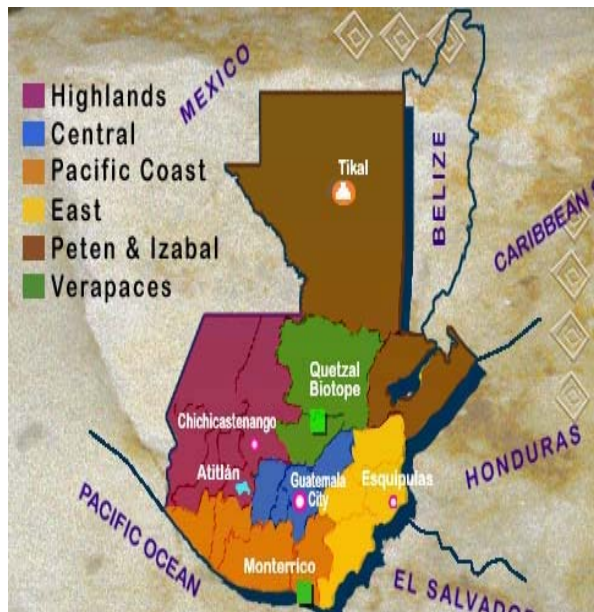


Fig.1 Map of Guatemala

Agricultural products with growth potential: Citric and tropical fruit.

Mineral outcrops in the region: Nickel, cobalt, and iron.

Region VII: Eastern Plains

Departments are Jutiapa, Jalapa, Chiquimula, Zacapa and El progreso. Population: 1,301,720 inhabitants. Elevation: 612-5960 ft. Average temperature: 68-82 °F. Access: By the inter-Ocean Highway and the Inter-American Highway.

Traditional agriculture products: Sugar cane, tobacco, coffee, corn, melon, okra, sesame seeds.

Agricultural products with growth potential: vegetables and tropical fruits.

Mineral outcrops in the region: Antimony, barium, zin, fluorite, manganese, gold, silver, and iron..

Region VIII: Pacific Coast

Departments are Escuintla, Retalhuleu, Santa Rosa and Suchitepequez. Population: 1,802,839 inhabitants. Elevation: sea level to 695 feet. Average temperature: 68-86 °F. Access: by the Pacific Coastal Highway.

Traditional agriculture products: Cotton, cardamamon, corn, black beans, sugar cane, cofee ,and soy beans.

Agricultural products with growth potential: Fuits, vegetable sponge, and ginger.

Mineral outcrops in the region: Iron, titanium, copper.

Project Organization

Several governmental and non-governmental organizations are building basic infrastructure projects all over the rural area's regions mentioned above. Two of the mos importants are: FONAPAZ (National Fund for Peace) and FIS (Social Investment Fund). FONAPAZ is working with projects in the areas affected by the internal war in Guatemala. FIS is working with all the rural area

groups without any distinguished or specific group as long as it is located at any of those eighth rural areas. FIS is one the highest investors in basic infrastructure project at the rural areas. Therefore this paper will describe the process of basic infrasructure project by FIS.

Comunity Organization Basis:

The infrastructure projects at the rural areas of Guatemala are beeing built, with a comunity organization basis. Communities at the rural areas are strongly recomended to participate in the projects, in order to obtain the financial support of them.

The prerequisites that a community has to have in order to obtain financial support of the infrastructure projects are: 1. Legacy tenancy of plots, 2) Strong organization and 3) if available, some local construction materials

1. Legal tenancy of a plot with property size where the project is going to be built, such as:

School or health building projects

- The tenancy of a plot that fits the building project its a must of the community.
- Civil infrastructure projects:

Water supply and farm irrigation systems:

- Legal tenancy of the source of waters for water supply and irrigation systems,
- Legal tenancy of the plots where the civil infrastructure will be built

Dainage and sewerage sanitary systems:

- Legal tenancy of the plots where the civil infrastructure will be built
- other special facts that project could require bridges and basic road access
- Legal tenancy of the plots where the civil infrastructure will be built

2. Strong organization of the community, in order to provide helpers (unskill labourers), during the procces of construction and after, for the mantenance of the project

Another, important fact asked to the rural area groups no matters what the type of the project, is the provision of helpers (unskilled labourers) during the construction process of the project. Social acceptance, of the project is mean to be that the community will participate in the stage of obtaining the project, as well as in the construction process. The participation means that the community and beneficiaries of the project will provide non qualified labour. These non-qualified labourers will play an important role in the construction process. This labour will not get any payment and it is a demand for the rural area groups in order to approve the project by FIS. Some of the activities hold by the community might be:

- transportation of the construction materials if there is no access to project site

- to provide a storage room for construction materials (cement, steel, concrete blocks, etc)
- to dig and backfill the building trenches after,
- Any work related to unskilled labour required for breakworkers, etc.

3. Local construction materials

Local material constructions are ask to the communities, if they are near to the site of the project. Some material could be: river sand, gravel and timber. However, some technical test and evaluations are made to the local materials to guarantee its quality.

Project Financing

To support community's basic infrastructure projects in rural areas the government has created several institutions in order to cover the areas mentioned above.

At first, municipalities are responsible for developing rural areas in the provinces; they use 10% of the national income to invest in infrastructure projects in their urban town and all of the rural areas. Due to the lack of infrastructure in urban zones, municipalities do not cover rural area's needs.

Because municipality's efforts have not been sufficient Guatemala's government has created several institutions in order to support people's basic needs of infrastructure at the rural areas of the country. The most important organisations are FONAPAZ (National Fund for Peace) and FIS (Social Investment Fund). Both institutions work with a community organisation basis.

FONAPAZ supports specifically war's refugees of the rural area groups. FIS supports all of the rural area's groups and communities with lack of basic infrastructure projects.

Nowadays, FIS is covering all the rural area's groups including some FONAPAZ target groups. Therefore, this paper will present experiences of projects in the rural area constructed by FIS. FIS process of designing, planning and production stages will be described for projects located in a rural area of Guatemala.

Social Investment Fund (FIS)

FIS is a Non Governmental Organisation created by the legislature No. 13-93 of the Congress of Guatemala, the 4th of May 1993. Since then FIS has been working on rural area's projects. FIS is leading the development process by constructing lots of basic infrastructure all over the country.

FIS is supporting the priority infrastructure needs all over the country. The target groups are communities living in extremely poor conditions in the rural areas of the country. FIS serves the villages supporting their effort to satisfy their basic social infrastructure needs. FIS is also improving the family incomes with productive projects. FIS helps the communities with:

- Technical assistance to identify their needs and to formulate the projects with quality due to solve their problems and serve the communities

- Communities' organisation to give legal representation to the informal groups in order to strongly organises them to contribute in the process of construction of their projects.
- Financial support, for the planning and construction of the new settlements in rural areas.

Project clasification:

The projects at rural areas are classified in four areas with its respective sub-classifications:

Social Assistance

Health
Nutrition
Education
Training for work
Development

Social Infrastructure I

Health buildings construction
Education buildings construction
Training Centres buildings construction
Social Infrastructure Projects
Latrines
Drain sanitary
Rain sanctuaries
Water systems supply
Environment
Forest
Environmental stoves
Public washing constructions

Social Infrastructure II

Development projects
Access roads
Bridges in access roads
Irrigation systems
Storage building constructions (products or services)

Productive activities

Community banks
Help-self employee
Small business

The aim of this paper is to describe the management construction process of projects at the rural area built by FIS. Therefore it will focus in the follow infrastructure project categories:

Building Projects

School Buildings
Health Buildings
Community Buildings

Civil Infrastructure Projects

Bridges
Basic road access
Farm Irrigation systems
Water supply systems
Drainage and solid waste disposal systems (latrines)
Environmental brick stoves

Design Stage

The design of the basic infrastructure projects is divided in two groups:

1. The preliminary briefing stage
2. The final design stage

1. Briefing Stage

Whenever a community of a rural area of Guatemala needs basic infrastructure, it addresses its requirements to FIS. An investigation of the factibility of the project is started. The evaluation of the project is conducted by a formal member (architect or engineer) of the institution.

Some of the aspects considered in this preliminary stage are:

- Legal and technical aspects (factibility of the project)
In this aspect, whe the a community ask for a project, FIS verifies the legal tenancy of the plot where the project is going to be built. According to the type and the size of the project considerations will be made.
- Human resources (sustainability of the project).
The investigation also seek for the organization of the group. In order to guarantee the participation of the community during construction and after delivering the project to the community
- Uses and environmental aspects of the project (functionality of the project): trough surveying the geodesical characteristics of the plots where the project is going to be built, the lands near to the project and so to find if local materials contructions are available in the region

2. Final design stage

The final design stage will start when a project has already been selected and approved. The type and size of the project will depend of the needs and the land resources of the community.

The final design stage is divided in two groups:

1. Projects with a typical design
2. Projects with a non-typical design

1. Projects with a typical design:

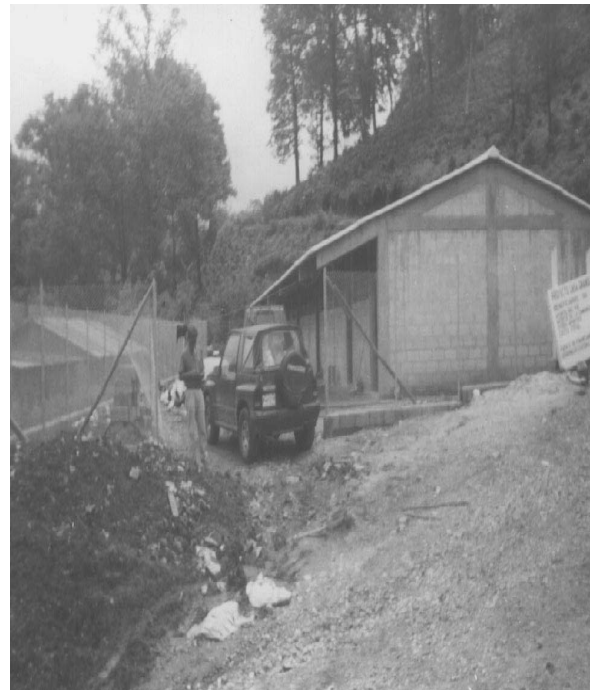
In this area the projects are elementary school and health buildings as well as basic sanitary infrastructure (latrines). Standard drawings, plans, technical documentation and bid of quantities exist already at the respectively department at FIS. Those projects use information and experience of projects that were designed for government institutions such as The Ministry of Education and The Ministry of Health.

To define the size and type of the building the investigation conducted by FIS at the rural area site will lead to seek:

- the amount of people that the project will attend
- The size of the land the community owns for the project

Types and size of elementary school buildings

- 1 classroom, kitchen, storage room and teacher dorm-113.44 m²
- 2 classrooms, kitchen, storage room and teacher dorm-186.75 m²
- 3 classrooms, kitchen, storage room and teacher dorm-260.06 m²
- 4 classrooms, kitchen, storage room and teacher dorm-333.36 m²
- 5 classrooms, kitchen, storage room and teacher dorm-383.36 m²
- 6 classrooms, kitchen, storage room and teacher dorm-433.06 m². The size will be chosen according to the amount of primary students to attend and the size of the land the community owns.



Building school, typical design. Chiantla, Huehuetenango, Guatemala. Julio 1998.

Type and size of health buildings

For health buildings FIS uses the classification given by the Ministry of Health for Hospitals and Health Centres are rural areas. Basically, each design depends upon the amount of villages and towns will be served and the size of land the community owns to build the project.

The basic design has an area of 125 m², with spaces for:

- Hall of waiting
- Medical consultant room
- Medical emergencies room
- Storage room for medicine
- Dormitory for people recovering from a disease
- Toilets

Basic sanitary infrastructure

These projects consist of building individuals latrines for urine and solid waste disposal. These latrines are built in

every house existing at the target community group. Two types of latrines are managed and the type of latrine to be built will depend basically of the soil conditions and culture of the users.

Pit latrine:

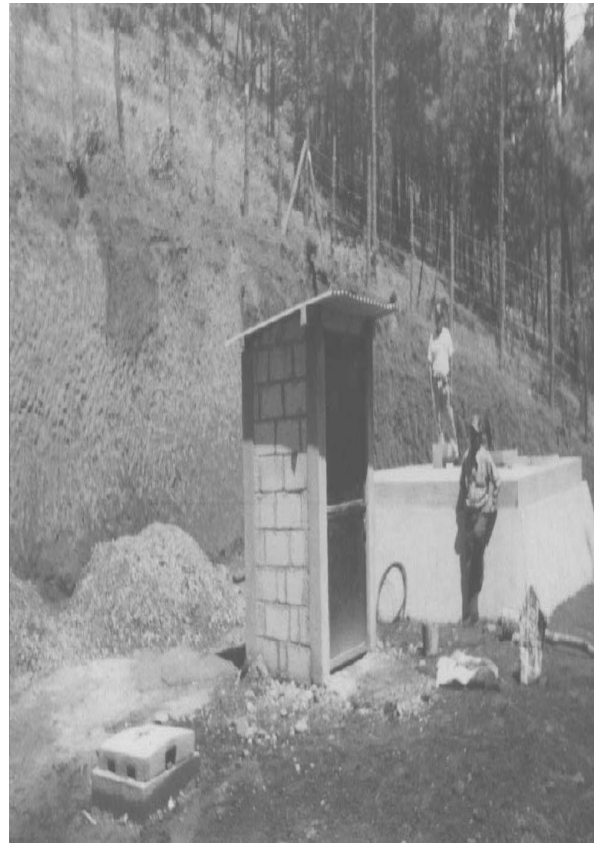
A small room fixed for a sanitary disposal built over a pit excavated at the plot.

Box environmental latrine:

A small room fixed for sanitary disposal built over a concrete box at the plot.



Basic sanitary infrastructure, Typical Design. Colmenas, Chiquimula, Guatemala, December 1998.-



Water Supply System, Non-Typical design. Quetzaltenango, Guatemala. January 1999.-

2. Projects with a non-typical design:

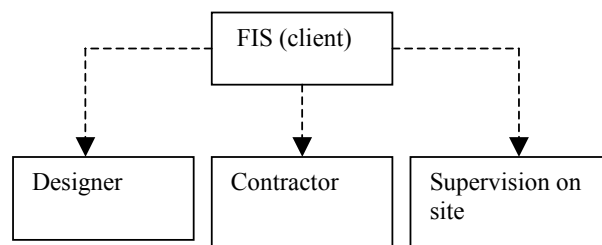
Projects with a non-typical design are:

- Water and irrigation systems
- Drainage and sanitary systems
- Bridges and basic road access
- Building for special purposes such as: storage of products growth at the communities and work training buildings. Design of special equipment and furniture is required in those buildings

These projects need a complete and specific design in any rural area it is going to be built. Therefore, specialist engineers and architect would be hired for the design process of these projects. Plans, basic and working drawing, terms and technical specifications, cost estimate, production information and method of construction will be required to the appointing consultant hired for the design of the project.

Procurement

FIS uses the method of the divided contract approach for procurement. FIS procures consultants for the designing activities, main contractor and ad supervision on site. FIS makes separated contracts with each consultant and a project manager of FIS performs the co-ordinating function. The contractor is responsible for the implementation of all construction work, including the subcontractor's work.



Contracting

FIS uses several types of contracting forms. It will be depending of the size of the project that are going to be executed. Most of the projects of FIS are small-scale projects.

- When the project is not above 180 m2. FIS uses the early selection approach. FIS owns a file of contractors recomended by the Civil Engineer and Architecs board. Files of availabe contracttors are

divided in groups according to the specific work of the contractor and the rural area regions he is working with. That means, FIS appoints the main contractor very early in the design process, according to the type and location of the project. FIS has already an established bill of quantities in the contract, which have to be done at the end of the execution period. The type of contract used by FIS in this case is a fixed price contract, which defines precisely the activities that have to be done by the contractor. The Lump sum contract is most of the time the form of contracting. FIS pays one sum, for the whole construction of the work shown on the contract.

- When the project is among 180 m2 to 300 m2, FIS uses a measure and value contract that is called most of the time unit price contract. FIS selects 4 contractor of its files of available contractors. They make an internal tender among these 4 contractors. The contractors receive a bill of quantities with the drawing and specifications of the project. It simplifies the qualification process for FIS when comparing offers and bids of different contractors. The lowest bid is generally chosen.

Designer contracting

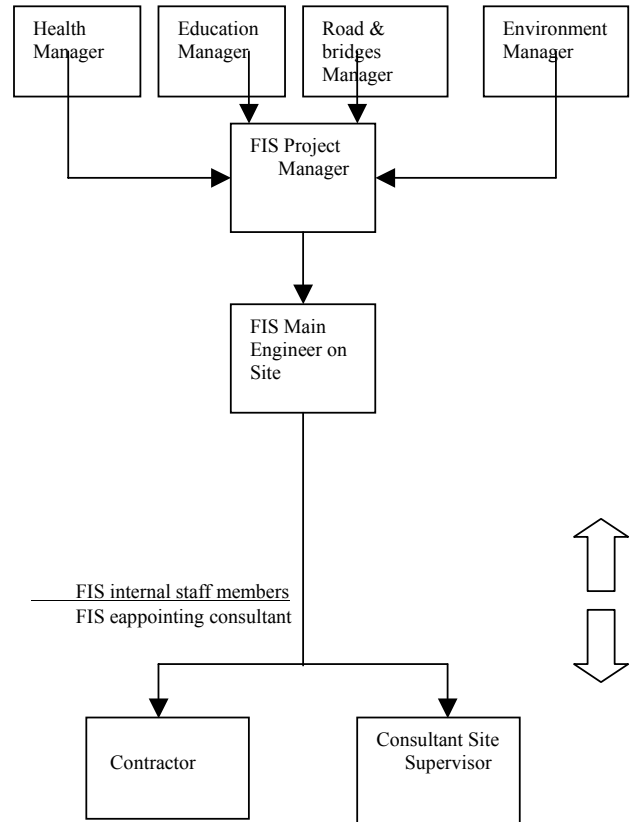
Whenever a non-typical design project is needed, FIS hires appointing consultants for the design, planning and documentation of the project. Specialists are required when the project has special characteristics. Generally, the price unit contracting form is used to contract the designers of the project. There are not tendering stage for design services. FIS owns file of consultants recommended by the Engineer and Architect Board of Guatemala.

Supervision on site contracting

FIS hires consultants for the supervision work on site of all the typical and non-typical projects that are going to be build. Most of the time the consultant hired does the Prequalification award committee of FIS recommend experienced engineers and architects. The price unit contracting form is used to contract the designers of the project. There are not tendering stage for supervision on site services. FIS owns file of consultants recommended by the Engineer and Architect Board of Guatemala

Project planning

Planning is a very important part of the process of construction of the projects. After selecting the contractor and supervisor on site of the project, FIS sets members of its internal staff for management of the construction process. Each department of FIS has its own specialist project manager. The planning line of a project is show in the next figure.



A member of the internal staff of FIS would be in charge of the control of the project construction process. This is call Main Engineer on site and there is one in every of the FIS’s target regions. Contractors and Supervisor will submit reports to the main engineer on site. The main engineer on site will present to the project manager, charts of the stages executed in the process of construction of the project. The project manager will prepare the progress payment estimation to the contractors and the supervision on site.

Contractors are asked to present a Bart chart of the project. The activities of the project are listed and described, and the time and resources needed are presented for each activity. FIS has prepared his own bar chart in standard formats. Those formats include description of the scope of work, the quantity, the unit of measurement, the unit cost, the total cost, the weight of percentage and the time scheduling. Following this is the bar charts divided into regular monthly interval periods. Whatever the form of contract is, the same process is applied for each project. Contracts are forced to follow the project planning.

When an unforeseen event appear, contractors are ask to present the scope of work with drawing, specifications and bill of quantities.

Supervisors are asked to review the planning project presented by the contractor as well as any change made on site of the project.

The project planner ensures that both parties are accomplishing the task they were assigned to do.

Project Financing

FIS obtains economical support from donor's countries, Germany and Japan are two of the most important donors for rural infrastructure in Guatemala. FIS also obtains credit loans approved by the National Congress of Guatemala. World Bank and Development International Bank are the most important financial institutions supporting FIS.

FIS targets the most urgent projects at the rural areas. FIS presents the budget to the financial institutions. When attending the aids, FIS addresses the financial support for every budget of the project selected.

The contractor receives an initial payment when signing the contract. The rest of the payments will remain through the process of construction of the project. In order to get their payments, contractors are required to present a cash-flow divided into three equal instalments and one left until the completion of the project.

The cash-flow describes:

- the capitalisation
- advance payment
- progress billing,
- retention
- taxes
- return of retention
- the total cash in –flow.

The project manager as well as the supervisor on site is concerned to verify the progress of the project before the approval of an estimation, whenever the percentage of execution in the project is achieved.

Budget and budget control

The initial budget of the project is early estimated at the briefing stage. In the direct contracting form or tender stage, the budget is confirmed.

FIS uses different cost data based on quantity and quality information from reference projects. Other types of data might be used, such as:

- reference data from specific project
- general reference data with connection to specific project
- and from specific data with additional information

The contractor presents a detailed list of activities with scope of work, quantity of materials and unit total cost of the projects. These are presented in special format required by FIS.

The main purpose of the standard format is:

- Project managers, main engineer and supervisors on site, can control the budget properly.
- To estimate the total cost before decision about investments are taken
- To follow the estimated cost during the project
- To check the amount of quantities executed in every period of construction
- To ensure that the percentage achieved in every stage is according to the planning and time scheduling
- To ensure that the payment to the contractor is according to the part of the execution is already done

However, continues could come up during the process of construction. Therefore, the contractor is asked to present a new budget detailing the new scopes of work that will be constructed as well as to renew the time scheduling program.

Information Technology

In order to obtain required budgets some computerised estimating systems are used by contractors and public institutions in Guatemala. Timberland is a well-known American system used to calculate and estimate budgets of the buildings. Nowadays, Microsoft Excel has become the most useful tool for budgets and planning purposes in Guatemala. Privates and public offices are presenting budgets for any project, using these spreadsheets of Excel.

Experiences to use in future projects

Some projects have presented difficulties when the time of the construction process arrives. Therefore, in the briefing stage, project planners have to ensure basic considerations, about technical characteristics of the project. Important facts to consider are:

- Property size depending upon the type of the project
- Property soil consideration for foundation (schools, health and community buildings)
- Property characteristics of the soil for each type of project (bridges, road access, latrines, sewerage and solid disposal, etc.)
- Property location in the community or in the houses of the community where the project will be built

Specific considerations for water system projects might be given: after a short time of using the water system for the communities, the source of water, stop producing the amount of liquid required. Therefore in the briefing stage project planners have to:

- To guarantee the capacity of the water source of the project
- The period of life of the source
- Make policies to the community for the maintenance of the source of water
- Make policies for the maintenance of the piping system as well

Some projects present difficulties when trying to follow the original design on site. Therefore, drawing and technical documentation have to be perfectly done.

In the construction phase, some mistakes are made for contractors due to lack of experience. Therefore, the contractor and the supervisor on site, should possess the necessary expertise for the highest level of construction and supervision of the projects.

Lack of organization at the target communities would greatly delay the projects. Training facilities should be given to the rural area's groups during the organization of the project. It will bring good results for the project, during the construction phase and when delivering the projects for maintenance.

Conclusions

In order to guarantee the successful quality of the project as well as its sustainability we must consider:

- A good evaluation of all the facts and factors involved in the project for the rural area groups. It will help to overcome any contingent in the construction process of the project.
- Selecting a rural area's community with human and land plots resources is the first step. Needs are all over the country but not all the rural areas are able to stand projects with a community organisation basis.
- Hiring the right appointing consultant, and so designers, contractors and supervision on site will lead the project to its highest level of consumption
- Considering the realistic time of the execution period of the project will be advisable
- Property management by the governmental or non-governmental organisation in charge of the project will guarantee the success of the project

By, taking basic infrastructure projects in rural areas of Guatemala, no just as individual projects, but as well planned projects immerse in a whole society group context, will lead to a progressively and effectively development of the country.

Production Stage

Tendering Stage

The tendering stage seek to look for the most qualified contractor capable of build from 15 to 20 small-scale projects in rural areas located in different regions of the country. If more than 20 small-scale projects are necessary to build sever public tendering will be conducted.

The tendering process includes elaboration of:

- Plans and drawings
- Technical documentation of the project/s
- Bill of quantities
- General specifications
- Project implementations
- tender notice and tender opening.

The procedure of selection of contract will be according to the internal rules and regulations of Social Investment Fund. Some other requirements about project implementations must also be considered when the World Bank and the Development International Bank are partly financing the project.

The institution has three ways of tendering contracts and it depends of the cost of the projects or its specific characteristics. Following, are the forms of tendering:

1. Direct tendering:

When the price of the project is below 43,000 USA Dollars. The project will be directly given to a reliable contractor chosen by FIS from the database. Some projects are lead to the direct tendering due to its special characteristics. Therefore, it can not be consider in a

internal or public tendering stage due to the price and special features it could have. The contractor is assuming to be qualified to undertake the project. The plans and the bill of quantities are given to the contractor in order to present the budget. A visit to the site is required. The contractor must build what it is described in the plans and the technical documentation. None extra work is recognised of any of the scope of work and activities described by FIS.

2. Internal tendering:

When the price of the project is between 43,000 and 102,000 USA Dollars. FIS chooses four reliable contractor in a random sampling from their internal files and databases. The plans and bill of quantities are given to those contractors in order to those contractors to submit the final offers. The date of the opening is fixed and the lowest bids will be choose. It is important to contractors to consider the time of execution given by FIS.

3. Public Tendering:

Whenever the price of the project is above 102,000 USA Dollars, a public tendering has to be done. This process includes tender notice and tender opening. Any national or international contractor may apply for the tender. Plans and specifications of the project are given by the institution FIS. Any contractor of the country members and associated are invited to participate. The opening date is fixed and the lowest priced will obtain the contract. However, capacity of the contractor will be examined by FIS before the contracting form is signed.

The tender notice is published at least once on the local newspapers. The time duration for the submission of the tenders is according to the size of the project. The contractor also submit a guarantee of the price in a 1% of the total estimate. If the tender submitted it is not in accordance whit FIS's procedures and regulations, may be not accepted.

Generally the lowest bidder is accepted. Considerations about the capacity and the experience of the contractor as well as his financial reliability are important facts on the final acceptance by FIS. The next steps of the process in to sign the contract which specifies scope of works and time scheduled when the project has to be executed.

Production Planning

When production planning is made by the Social Invest Fund the most important facts to considered are:

Time aspect

Human aspect

Economic aspect

High quality of construction by using good materials and resources

Time scheduling

The execution period of time is a very important fact considered by FIS. Due to the urgent of the projects for rural area groups, the process of construction of each project is about 4 months. Most of the projects are planned to be achieved in this short period of time. If the

project is not concluded by this time, the main contractor will be asked to pay a bill.

The contractor will present a chart Bart that he will show the period of execution of all of the main scope of works. This chart Bart is a standard format created by FIS. This form shows basically the following aspects:

- the scope of work of each activity of the building
- the quantity of materials
- the unit of measurement
- the unit cost
- the total cost
- the weight of percentage
- time scheduling
- Bart charts by weeks and months

The contractor is also required to present the way he will supply the project due to FIS to control the quality and the quantity of materials.

Human aspects

One of the most important issues in the projects of FIS is the participation of the local people as non-skill labour. Comunitarians are asked to strongly participate in the construction process. FIS demands of this task to the community in order to:

- -provide helpers to the manpower in the construction process
- -provide transportation for the project, from the point the road access finishes to the site of the project (most of the projects in rural areas are begun built in areas where the access is done just by walking or riding mules and small horses)
- -provide organisation to the rural area groups for the maintenance of the project
- -to become themselves organised for the sustainability of the project and future projects to come

Some other projects are partly executed with local governments authorities (municipalities). In this case municipalities take care of supplying the project with helpers and some local materials as well.

Economic aspect

FIS is in charge of all the financial support of the basic infrastructure projects of the rural area of Guatemala. Therefore, with the reports and approval of supervisor on site, main engineer on site and project manager the progress payments will be made to the contractor in charge of the project.

FIS asks its internal members and appointing consultants, to present a photograph accompanying the formal reports and estimations. In that form, FIS will guarantee the use of its internal budget.

Quality assurance

FIS hires consultant designers, contractors and consultant supervision on site in order to guarantee a high level of performance of the projects in rural areas.

When the construction process is initiated FIS starts controlling and managing the project undertaken. FIS has its own internal professional staff. Every department owns

its head manager. After him there are several engineers and architects playing positions as project managers in charge of the different projects at the different regions of the rural areas.

FIS also contracts appointing consultants such as supervisors on site. These supervisors parallel work with contractors in order to control and monitor every stage of the construction process.

Contractor presents the time scheduling and the whole technical information as well as the legal and contract documentation of the project to the supervisor on site. The supervisor on site analyses the information received and presents comments to the contractor. The supervisor on site addresses the information to the FIS's project manager so they can all have the programme of the construction process. With this information after finishing every stage the project was divided in they will provide the estimated payments to the contractor by signing the standard formats he presented at the beginning of the project.

Project managers of FIS are constantly informed by supervisors on site about the quality of materials, execution per cent rate obtained and the control of time scheduling as well in order to control and to guarantee the quality assurance of the project.

To guarantee the long-term period of life of the projects, project managers, main engineer and supervisor on site will demand the quality of the material use during the construction process.

Materials used in the Construction Process

Walls

Most of the time the normal regular material used for constructing walls are: cement concrete blocks. Due to the urgency of the projects, prefabricated materials are being used for walls. Prefabricated materials and cement concrete blocks are provided for recognized local distributors.

Roofs and Ceilings

Galvanized iron sheets, fiber cement sheets, and reinforced cement concrete slabs, are the most used systems for roofs and ceilings.

Mortar

Mortar is made of cement and fine sand. No other material is accepted to mix with cement for mortar.

Floors

Cement concrete and mosaics are most used for floors.

Doors and Windows

Due to the location of the projects at the rural areas, doors and windows are made of steel in forms and metal sheets. Sometimes, aluminium is used in windows.

Water Supply and Sanitary

PVC rigid and flexible pipes, Galvanized iron pipes, asbestos pipes, steel pipes and cast iron pipes.

Finishes

External and internal finishes: water proofing cement paint.

Maintenance Planning

The infrastructure projects at the rural areas do not have any maintenance at all. The community is responsible for the care of the building. They are also asked to have an internal fund, in order to pay a skill worker if any work for the project is desired.

School, Health and Community buildings most of the time, just required paint every certain period of time. Comunitarians take care of getting funds for painting and some other activities.

Water supply systems required more maintenance. When organizing the community groups, they receive some seminars courses for uses of the system, care of the source of water and maintenance of the pipes. Also, for solid waste disposal and latrines, people are instructed of their use and maintenance.

For basic roads and bridges, none maintenance is established at all.

Experience to Use in Future Projects

In the last two years, construction process of some buildings at the rural area were stopped. The contractor were awarded of those projects by public tendering. Some projects are still remaining to build the finish stages. When the contractor was asked to finish his work, he presented a lot of difficulties on site to finish the projects. When doing the research on site to verify his arguments, it was found:

- Plans and final drawing did not match with community requirements.
- General specifications were not agree to the type of soil where the project was going to be built.
- Design for the climate and geographical conditions were not the desired
- Community groups wanted to change the scope of work of the projects
- The projects needed a lot of implementation on site. This extra work were not considered in the bill of quantities.
- Community groups were not able to participate in the project, due to solve their own family need.
- Time scheduled was not very well planned. Most of the projects did not have access to the site where they going to be built. Therefore, transportation of materials were a hard task to realize. Some projects were 7 kilometers, far away from the nearest road.

Conclusions

Public tendering should be analysed very carefully. Lots of problems would appear if good considerations are not made.

The project manager in charge of the tendering stage should sharply review:

- Plans and final drawings
- Technical specifications of the projects
- Bill of quantities
- General implementations

Before signing the contract, contractor has to show:

- He knows about the projects and its locations
- He is experienced to work with that kind of projects
- He owns the infrastructure and logistic for the projects.

Recommendations

- Property planning, cost analysis, resource optimising and time scheduling are facts among others, to be considered, in order to obtain a successful project
- Due to the location of the projects, impact of construction in the environment is also a fact to take care about.
- Planner must suggest low-impact alternatives in order to prevent damages to the natural resources in the rural area's groups
- Using property technology of materials would lead to emphasise the care of natural resources of the country
- Quality assurance is necessary to guarantee a long-term period of life of the projects
- Planning individual basic infrastructure in a whole context would lead to communities to improve their living conditions

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