

**Reconstruction management and post-disaster low-cost  
housing; the case for social reconstruction**

A report submitted to the Faculty of Graduate Studies and Research in partial fulfilment  
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While the number of deaths, injuries and economic losses caused by disasters increases every year worldwide, reconstruction programs in the Third World continuously fail to recover poor communities from destruction. Research demonstrates that despite that enormous resources are devoted to post-disaster reconstruction, very few housing programs targeted to low-income families have drawn to sustainable development. Furthermore, increasing uncontrolled urbanisation, growing poverty in largely populated developing nations, and insufficient mitigation programs suggest that disasters as harmful as those occurred this year, are far to be coming to an end.

Low-cost housing is one of the most important components of post-disaster reconstruction. It plays a major role in people's vulnerability to disasters and in the mitigation stage, effecting not only the number of deaths, injuries and suffering population, but also the future quality of life of the survivors. Based on the latest post-disaster theories, this report hypothesises that successful social reconstruction requires the co-ordination between "physical factors" directly related to shelter provision, with "soft factors" such as education, employment and economic opportunities for the community, taxation policy, and the provision of information and technical assistance.

This report presents a case study of a reconstruction program that responded to the dramatic consequences of the January 1999 earthquake in Colombia. This program, which included an ambitious rural housing agenda, illustrates the importance of judiciously combining the 'physical' and 'soft' factors. Focused on one of the most vulnerable communities and with an innovative institutional structure, the program illustrates several aspects required for the development of culturally and technologically appropriate housing. Looking beyond the dramatic analyses frequently used to interpret natural disasters and their consequences, surprising findings from the case study also suggest an alternative approach for the evaluation and development of reconstruction programs.

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## **Diagrams**

The following diagrams have been inserted in the text. They are provided as a reference to consult during the reading of the chapter where they are located. Concept and graphics by Gonzalo Lizarralde.

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- Model of analysis for the 1999 earthquake in Colombia

### **Chapter four**

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## Glossary - Basic terms

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The terms, proposed by different organisations, are included in the United Nations Department of Humanitarian Affairs' book: "*Glossary: Internationally agreed glossary of basic terms related to disaster management*". This publication collects the internationally agreed definitions of disaster-related terminology.

**Disaster**: A serious disruption of the functioning of a society, causing widespread human, material, or environmental losses which exceeds the ability of affected society to cope using only its own resources.

**Disaster management**: The body of policy and administrative decisions and operational activities which pertain to the various stages of a disaster at all levels.

**Evaluation**: Post-disaster appraisal of all aspects of the disaster and its effects.

**Hazard**: A threatening event, or the probability of occurrence of a potentially damaging phenomenon within a given time period and area.

**Mitigation**: Measures taken in advance of a disaster aimed at decreasing or eliminating its impact on society and on environment.

**Lifelines**: The public facilities and systems that provide basic life support services such as water, energy, sanitation, communications and transportation.

**Population at risk**: A well-defined population whose lives, property and livelihoods are threatened by given hazards.

**Reconstruction**: Actions taken to re-establish a community after a period of rehabilitation subsequent to a disaster. Actions would include construction of permanent housing, full restoration of services, and complete resumption of the pre-disaster state.

**Rehabilitation**: The operations and decisions taken after a disaster with a view to restoring a stricken community to its former living conditions, while encouraging and facilitating the necessary adjustments to the changes caused by the disaster.

**Secondary hazards**: Those hazards that occur as a result of another hazard or disaster, i.e. fires or landslides following earthquakes, epidemics following famines, food shortages following drought or floods.

**Vulnerability**: Degree of loss (from 0% to 100%) resulting from a potentially damaging phenomenon.



## Chapter one - Introduction

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*“In the earthquake I was with my wife, Rubiela, in the town, and we were surprised to see the houses falling down....we almost had to walk to my farm as there was no transportation. When we arrived, I felt happy to know that my family was alive, but at the same time very sad to see the house totally destroyed... We thought we could not rebuild our house again because we didn't have any resources...”*

Oscar Bermudez. citizen and farmer of Calarca, Colombia; when asked about his experience in the earthquake (Translated from Cafered, January 25 2000. p.15).

This family, as well as millions of families in the world, was affected last year by a disaster. In 1999, disasters left 105,000 deaths, and losses for 100 billion dollars (Insurance Swiss Company Swiss Re, as reported by the AP. Journal de Montréal, March 8, 2000). In earthquakes alone, 15 million people suffered serious injuries and 100 million had their homes destroyed in the last century (Hewitt, *Regions of Risk*.1997, p. 197). Disasters are common scenarios calling for the contribution and co-operation of international institutions. They take the attention of local and international media, and in several cases institutions put up with enormous economic resources in places where the regular economic conditions are already critical. Even though several strategies have been proposed, post-disaster housing has frequently been a controversial aspect of the reconstruction and mitigation stages. Therefore, the kind of aid that can, or should be provided, the interaction of international agencies with regional institutions, the role of the local government, and the participation of the community, are frequently targets of discussion. In order to provide the fastest relief, the most efficient shelter and the most adequate mitigation program to affected communities, different strategies have been proposed. However, the report of failures is frequent and sheltering communities after disasters is still a big challenge for

architects and decision-makers. I carefully consider, for the rationale of this study, the importance of knowledge leading to the appropriate use of economic, environmental and human resources in reconstruction, for both developing as well as for industrialised countries.

I suggest in this research, that post-disaster low-cost housing is more than a technological problem. Successful reconstruction requires the co-ordination between factors that in this study I have classified as 'physical' and 'soft' factors. Furthermore, complementing the usual dramatic analysis of destruction, deaths and damages, I suggest an alternative approach to discussing disasters and reconstruction.

The objectives of the research are: (i) to contribute knowledge in two complementary areas: in the development and in the evaluation of post-disaster programs of reconstruction, (ii) to report on and evaluate the experience and lessons of the reconstruction program conducted in Colombia, and (iii) to recognise and measure the different factors that influence post-disaster residential programs.

The present study is intended for students and professionals in architecture and planning who are interested in low-cost post-disaster residential reconstruction.

The methodology proposed by Robert Yin (1984) is the base for the design of the case study and the formulation of "*analytical generalisations*". First, the theoretical framework is presented through the analysis of reconstruction theories. The research also presents the recommendations and procedural criteria of the most prominent institutions involved in post-disaster attendance world-wide (i.e. World Bank,

UNESCO, OXFAM, UNDRO). Prior to the analysis of the Colombian case study, general conditions of the local context are presented. The extreme prevailing conditions influencing housing are reported through the compilation and analysis of statistics, plans, official reports, pictures and general data.

In January 1999, an earthquake in Colombia left 1.170 dead, 150.000 homeless and destroyed almost 40.000 houses with 1.66 billion US dollars in direct damages. The disaster (the sixth most harmful in terms of human losses in the world in 1999) struck the country in the midst of a dramatic economic recession and a very complex political situation (Cepal. *Ensayos sobre economía cafetera* 14, 1999). Furthermore, the rural population is one of the communities that is most vulnerable to disasters in Colombia, as indeed it is the case in many other countries. However, the rural reconstruction program developed by the Coffee Growers' Federation (CGF), based on helping the community to cope with the situation through an efficient institutional model, developed an ambitious housing agenda, targeted at more than 10.000 peasant families within a period of 10 months (*Cafered*, January 2000, p. 10).

A prefabricated housing program was also promoted during the reconstruction period. However, prefabrication is not only relatively new in the Colombian housing market, but it is commonly criticised in low-cost residential reconstruction. Therefore, the introduction of prefabricated rural housing in a community where indigenous materials and conservative typologies are strongly rooted was a somewhat risky experiment from which many conclusions are drawn.

I employed a different methodology to collect information in each of the stages of the research. The first one to collect the information to elaborate the theoretical framework, the second one to report the case study and the third one to evaluate the reconstruction program. I consulted the publications listed in the bibliography of recent academic studies to collect the contemporary theories and studies in the post-disaster field. I then applied the aforementioned method to the new publications I found and repeated the tests several times, gaining an expanded selection of pertinent books and academic journals. Though I consulted numerous publications relating to housing reconstruction, for the conceptual analysis I focused predominantly on academic publications and studies from international institutions specialising in the post-disaster field. Considering the rapid evolution of the theories pertaining to the geographical analysis of disasters, the second chapter is based on recent approaches proposed in the last ten years.

To report the case study, I obtained several sources such as articles, pictures, maps, statistic tables, official reports, plans and interviews from private publications, Internet web pages, newspapers, and journals. As no official academic research has been previously devoted to the 1999 Colombian reconstruction program, first sources of information proved invaluable. The evaluations conducted by the institutions involved were particularly useful. Through comparative research, I limited resources to only reliable quantitative-supported evaluations. In the same way, I compared critical journalism and editorials with statistics and results. After this process I analysed only a limited number of articles from prominent newspapers. In case of contradictions, I honoured official reports from private, public or independent organisations over those

from editorial critics. Nevertheless, I confronted official reports with the analysis of neutral, international observers to insure their accuracy.

I based my evaluation of the reconstruction program on official evaluations as well as on the information obtained in the fieldwork. This information included a graphic and photographic report in addition to the collection of testimonies from the community and interviews with officers of some of the institutions involved.

In order to obtain testimonies from the community, I conducted several meetings with the families living in the rural areas of seven municipalities (i.e. Pereira, Quimbaya, Montenegro, La Tebaida, Circacia, Salento, Finlandia and Armenia). Though I conducted a questionnaire in each visit, I was careful to an informal dynamic with each family, leading to the spontaneous discussion of their observations. Due to the importance of the analysis of 'human aspects' of reconstruction, I gave special consideration to conversing with the peasants. In fact, during the visits, I had the opportunity to familiarised myself with the houses, the production areas and the coffee plantations, frequently indulging in a cup of coffee as I listened to the opinions from different members of the families, this was an enriching personal experience. In the interviews conducted with members of the Coffee Growers' Organisations, I did, indeed, pose previously prepared questions; however, spontaneous comments and observations were more illuminating in terms of the case study.

Within the scope of the research, this report focuses on the programs promoted by the Coffee Growers' Federation and the central government. I do not cover in detail the

study of other agencies' programs. In fact, the analysis of these programs may be a topic of future research.

## Chapter two - Post-disaster housing theory

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In the context of an updated theoretical framework, this chapter highlights several theories and studies that argue the importance of human aspects in the process of reconstruction. This section compares two different approaches to post-disaster housing and discusses their advantages and limitations.

The strategies adopted to house survivors after a disaster can be grouped in two main approaches. In the first one, shelters are associated with an object, that is to say, with a final product that is provided to the affected community. Following this approach, several industrialised solutions for emergency, temporary and even permanent shelters have been manufactured to meet the needs of reconstruction. Relevant historic examples include: the polyurethane domes produced in 1970 by the West German Red Cross in collaboration with the Bayer Chemical Company (fig. 2.1), the can-like cylindrical shelters promoted by the Austrian government, and the permanent and so-called “Russian houses” proposed for Yungay in Peru (1973). Recent prototypes include the use of military and civil defence tents and several new American prototypes commercialised by private companies (fig. 2.2 and 2.3)



**2.1 Left:** Polyurethane domes designed in 1970 by the West German Red Cross in collaboration with the Bayer Chemical Company.

**Previous page 2.2 Centre and 2.3 Right:** Emergency shelters designed by the “Affordable instant storage shelter & greenhouses”. 1997. Source: <<http://instantshelters.com/camp.html>>. (October 20, 1999).

In a second group, housing is associated with a process and is considered as an integral part of a complex permanent reconstruction program. According to this approach, ambitious plans of community reconstruction, victims' participation, self-help construction and holistic measures of development have been proposed and extensively documented by scholars. A relevant discourse is proposed by Andrew Maskrey, who presents, in *Disaster mitigation: A community based approach*, lessons obtained from several cases of disaster mitigation in Peru. His research associates the disaster mitigation strategies with special emphasis on the community participation.

Maskrey's research is conducted from the assumption that disasters are the result of the conjunction between a natural hazard, and socio-economic and political processes. Years later, this approach was illustrated by Blakie and colleagues in the disaster-pressure model that will be the base for the elaboration of the model proposed in chapter three. Maskrey's study clearly encourages the practice of the community-based mitigation programs. In the final chapter, the study suggests guidelines for other institutions and establishes a number of priorities and principles for successful implementation. A similar methodology and argument is presented by Yasemin Aysan and Paul Oliver's book *Housing and Culture after earthquakes*. In their study, after presenting a particular case study in Turkey, appropriate policies to follow in the future are suggested.

Aysan-Oliver's study strongly recommends avoiding forcing the relocation of settlements unless there are "strong ecological problems, continuing risk of immediate hazards, or insuperable problems in moving debris." (28). This approach is shared by



many other authors such as Albert Cuny (*Disasters and development*). The argument also discourages the use of emergency imported shelters, by considering them not feasible solutions, as UNDR0 in the book *Shelter after Disaster* explains:

“Universal standard shelter is not feasible because it ignores: [i] The high price and poor cost effectiveness of the product in the disaster affected country, [ii] the need to involve disaster survivors in satisfying their own needs, [iii]...climatic variations, [iv] variations in cultural values and house forms [v] variations in family size, [vi] the need of families to earn their livelihood in their houses, [vii] local capacity to improve shelter, [viii] the problems of obtaining suitable land at low cost on which to build such shelters, [ix] the logistical problem of transporting and distributing, [x] problems of appropriate technology”.(25)



Some international institutions involved in post-disaster housing strategies:

**2.4 Left:** Oxfam Logo. Source: [www.oxfaminternational.org](http://www.oxfaminternational.org). (October 20, 1999)

**2.5 Centre:** United Nations Logo. Source: [www.un.org](http://www.un.org). (October 20, 1999)

**2.6 Right:** UNESCO Logo. Source: [www.unesco.org](http://www.unesco.org). (October 20, 1999)

The relation and importance of social aspects in the post-disaster housing process are discussed in the Oliver-Smith article “post-disaster housing reconstruction and social inequality”, published in 1990, in the journal *Disasters*. According to Oliver-Smith “greater attention needs to be paid to the issue of social stratification and its relationship to post-disaster reconstruction for social change and development.”

The recent article of Souheil El-Masari “Learning from the people: A fieldwork approach in war-damaged villages in Lebanon”, published in the book *Reconstruction*

*after Disaster: Issues and practices* in 1997, documents how understanding both the social context and the people's needs are fundamental pre-requisites to meet the reconstruction after a disaster. The article presents an approach called "reconstruction with people", where the response is based on an understanding of the social environment of the disaster and the role of the survivors is articulated in the reconstruction program.

This holistic perspective of disaster-related housing also influences the application of appropriate technology. Concerning technology, a relevant concern in risk reduction is what UNDRO has called the "roofing problem". According to this approach, contemporary theories encourage the practice of relying on training methods instead of technology transfer for the improvement of construction and the reduction of vulnerability. The article "Learning to built safe roofs: UNESCO's role", published by the United Nations Department of Humanitarian Affairs on the *DHA News Journal*, is an inspiring example of the current concern regarding roofing technology and the training methods' approach. On the other hand, the technology transfer approach has been considered to be "disappointing" (UNDRO, 41) and is frequently criticised by many scholars. Influenced by these concepts, Weldelibanos' thesis at McGill University argues for the application of traditional technologies and indigenous materials combined with efficient structural systems. This practice has been qualified, in the context of traditional settlements, as a more convenient response for risk mitigation and reduction.

This section focuses on the analysis of the two main approaches used in housing reconstruction. However, the publications read during the literary review introduce other aspects that are directly related with the Colombian case study. Table 2.1 summarises some of the publications that, being related with post-disaster reconstruction theories, were read during the literary review. The date of publication, the author, and a simplified description of their theoretical approach are also listed.

The table 2.1 illustrates that, during the last twenty years, several authors have investigated the social aspects of the housing reconstruction process. While doing so, some authors have gone even further in disqualifying the use of the approach that associates housing as an industrialised product that is provided to the affected community. This is an argument that is easy to support, considering the numerous cases of dissatisfaction and failure in the use of industrialised solutions within the last three decades. However, before falling into the trap of drawing extreme conclusions, it is important to evaluate individual cases and to pay special consideration to the climate. Extreme weather conditions (extreme hot, rain or cold) can not be excluded as a priority when selecting the type of approach to be implemented. In fact, in cases where extreme temperatures can promptly endanger survival, construction speed is a relevant factor and the fastest shelter solutions can be the most advantageous.

| <b>Author</b>                                    | <b>Publication</b>  | <b>Year</b> | <b>Topic studied</b>                 |
|--|---|-------------|--------------------------------------|
| World Bank                                       | <i>Risks and reconstruction: Experiences of resettlers and refugees</i> | 2000        | Social improvements after relocation |
| El-Mansari, Souheil. Edited by Awotona, Adenrele | <i>Reconstruction after disaster: Issues and practices</i>              | 1997        | Reconstruction with people           |
| UNESCO   | <i>DHA News Journal</i>   | 1997        | Programs of education,               |

|  |  |      |  |
|--|--|------|--|
|  |  |      | participation and women involvement  |
| United Nations                                 | UNDRO. <i>Shelter after disaster</i>   | 1993 | The social reconstruction of the community   |
|  | UNDRO News   | 1992 |  |
| Weldelibanos, Fitsumberhan<br>Thesis at McGill | <i>A survey of earthquake mitigation strategies and building principles for small traditional dwellings</i>  | 1993 | The importance and possibilities of traditional technologies in the reconstruction process   |
| Oliver-Smith, Anthony                          | <i>Post-disaster housing reconstruction and social inequality: A change to policy and practice</i>   | 1990 | The importance of social aspects in post-disaster reconstruction   |
| Maskrey, Andrew                                | <i>Disaster mitigation: A community based approach</i>   | 1989 | Community based mitigation programs  |
| Yasemin, Aysan and Oliver, Paul                | <i>Housing and culture after disasters: A guide for future policy making on housing in seismic areas</i>   | 1987 | Permanent reconstruction and social consequences after resettlement. The importance of the community in the reconstruction process |
| Davis Ian                                      | “Developments in the provision of culturally sensitive housing within seismic areas 1981-1986”<br><i>Proceedings of Middle East and Mediterranean regional conference on earthen and low-strength masonry buildings in seismic areas</i> | 1987 | The importance of the participation of survivors and education programs  |
| Oliver, Paul                                   | <i>Disasters and the small dwelling</i>  | 1981 | The importance of understanding low-cost residential reconstruction beyond the technical aspects                                   |

**Table 2.1.** Some of the publications that, being related with post-disaster reconstruction theories, were read during the literary review.

Some of the documents listed above encourage the policies of indigenous permanent solutions for post-disaster strategies in developing countries. However, for other authors in the low-cost housing field, the disadvantages of residential prefabrication for developing countries does not seem to be that clear; or at least, they seem to be dependent on several factors. Such is the case of Melanie Stallen, Yves Chabannes

and Florian Steinberg, who constituted a research team in the Institute for Housing and Urban Studies (IHS), in the Netherlands. Their study, published in the 18th Volume of the Journal *Habitat International*; presents an alternative point of view with regard to the advantages or disadvantages of housing prefabrication in Colombia and other developing countries (see fig. 2.7 and 2.8).

In their report, the authors demonstrate that prefabrication can make a positive contribution to low-income housing solutions. The applicability of light prefabrication is based on the pattern of local resources and reflects the state of the local 'technical culture'. IHS suggest that a change of scale in the construction market can be introduced by combining prefabrication and *self-help/mutual-aid* for large-scale low-income projects. The study shows that, "given the right circumstances, costs can be reduced, employment opportunities generated, low skill levels utilised, opportunities created for women and the local resources can provide the basis of such prefabrication." However, those circumstances depend mainly on the use of "light" prefabrication systems, that unlike the "heavy" systems, do not rely on external inputs with acquisition of patents, equipment, know-how, and raw materials from "the outside". The proper circumstances are gained through the careful articulation between local and external resources.



**2.7 Left:** House produced with prefabricated panels. Company: Plycem de Colombia. Source: [www.pazco.com.pa/sist\\_const.htm](http://www.pazco.com.pa/sist_const.htm). (Nov. 10, 1999)

**2.8 Right:** Low-cost house produced with prefabricated components. Eternit de Colombia.  
Source: [www.dircamacol.com.co/eternit/canal.htm#PLACAS](http://www.dircamacol.com.co/eternit/canal.htm#PLACAS). (Nov. 10, 1999)

The Colombian case study reported here takes place in a developing country where housing policy has been frequently criticised. With a community participation approach, and in order to meet low-cost housing, the government developed several experiments of self-help construction during the last decade. Alan Gilbert in the essay “On subsidies and home-ownership: Colombian housing policy during the 1990s”, published in 1997 in the *TWPR Journal*, makes a strong criticism of the strategy adopted by Colombia and encouraged by the World Bank during the last decade. Critical analysis is made about the sites and services programs, according to the study, “offering subsidies for homes but not for services is highly questionable” (51). Gilbert concludes that there can be little doubt that Colombian housing policy before 1990 left a great deal to be desired. Even when the modifications made after 1990 incorporated some real improvements, still questionable elements remained in Colombian housing policy. (67)

With regard to the market of low-cost housing, Katherine Gough’s academic paper, published in the *Housing studies Journal*, presents a study conducted in one of the cities affected by the 1999 earthquake. It demonstrates that “few self-help houses enter into the housing market in Colombia” (149). According to the study, even when self-help construction is a popular practice for lowest income families, houses are usually occupied by the family and rarely rented or sold in the market.

In this context of a mediocre governmental housing policy and a timely rooted tradition of self-help construction, a low-cost housing program in Colombia confronts several

challenges. These include not only financial challenges in the middle of a destabilised mortgage credit infrastructure and an economic recession but also the challenge of making appropriate methodological decisions in an increasingly competitive construction market invaded by relatively affordable new prefabricated solutions.

## Chapter three – The Disaster

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Shelter provision after disasters, unlike housing programs in regular circumstances, is greatly affected by extreme conditions that need to be clarified through the analysis of the disaster itself. Closely related with both the 'physical' and 'soft' factors of reconstruction, these conditions are discussed in this chapter.

### 3.1. Introduction. Model of analysis

Based on the human ecology approach proposed by Kenneth Hewitt, and the vulnerability perspective studied by Blaike and co-workers, this chapter presents a model that has been specially adapted for the analysis of the January 1999 earthquake in Colombia. The model highlights the following factors, important for the analysis of the case study:

1. The importance of the built environment in the pre- and post-disaster stages
2. The analysis of vulnerability
  - The positive aspects that can be gained after the disaster. These are mostly related to improvements on previous conditions, reduction of vulnerabilities to similar events, and lessons to the community and institutions
  - The strengths of the community, as a complement to the vulnerability analysis approach
  - The assumption that proper attention to vulnerabilities leads to a reduction of the effects of the next hazard
3. Time as an important factor for the analysis of disasters

#### 3.1.1. The importance of the built environment

Even as the number of populations affected by disasters increases yearly, still the way we build the environment is one of the most important factors that put people at risk and therefore make them vulnerable to disasters. According to Hewitt, "Residential



buildings are nearly always damaged in disasters in the greatest numbers. Deaths and injuries are mainly due to the collapse of buildings, most often people's homes. The largest numbers of more seriously affected survivors are those left homeless" (*Regions at risk*, p. 202). Blaike and co-workers also highlight the importance of the built environment in earthquakes. According to their study, "Over 95 per cent of all deaths in earthquakes result from building failures [...] The overwhelming majority of people who die in earthquakes are killed by the collapse of man-made structures, particularly domestic dwellings" (p. 169). However, housing is not only important in determining the vulnerability of the community, it is also crucial in the post-disaster stage. After the disaster, an important indirect threat is the exposure of the homeless to inclement weather, a particular threat for injured survivors, small children and the elderly (Hewitt. P. 210). Inappropriate responses to housing after disasters are usually associated with subsequent social problems caused by rapid migration, violence, abuses, crime, economic recession, lost of identity, diseases and lack of production.

### **3.1.2. The analysis of vulnerability**

It has often been said about disasters that they usually repeat in the same places affecting the same communities, who are each time more vulnerable and with fewer resources to mitigate the effects and to be able to recover. However, appropriate measures after disasters may also represent improvements on previous conditions, reduction of vulnerabilities to similar events, and lessons for the community and institutions, all useful in the mitigation of future events. As an example, Blaike and co-workers describe four positive actions that can result from a post-disaster program. "(i) Change (of) unjust structures, (ii) local institutions can be strengthened and the

capability of families to reduce their own vulnerability can be improved, (iii) the disaster provides an opportunity to develop effective risk assessment with good cost-benefit arguments for protective measures; and finally (iv) disasters provide an opportunity to educate political leaders and decision-makers about the true nature of vulnerability to disaster risk.” (p. 89). Moreover, UNDRR refers to reconstruction as “the opportunity for risk reduction and reform” (Shelter after disaster, p.38).

The vulnerability perspective analyses the causes that put people at risk and in unsafe conditions. According to Blaikie et al., vulnerabilities are due to unsafe conditions derived from earlier pressures and certain root causes. Yet, affected communities also count on certain strengths to deal with disasters. According to latest reconstruction theories, such as those by Yasemin Aysan, Albert Cuny, Andrew Markrey, Oliver Smith and Ian Davis, victims are not helpless, they make decisions, and develop coping strategies. In fact, considering the importance of their participation and strengths, United Nations uses the term ‘survivors’ rather than victims. Proper assessment of the vulnerabilities of a community, especially in housing, leads to a reduction of the effects of hazards that follow, in terms of physical losses, injuries and deaths.

### **3.1.3. Time as an important factor for the analysis of disasters.**

Time is an important factor in two different levels, the time in which a disaster occurs and the time-scale for post-disaster activities. The hour, day and season in which a hazard occurs are usually studied to determine the effects on human settlements.

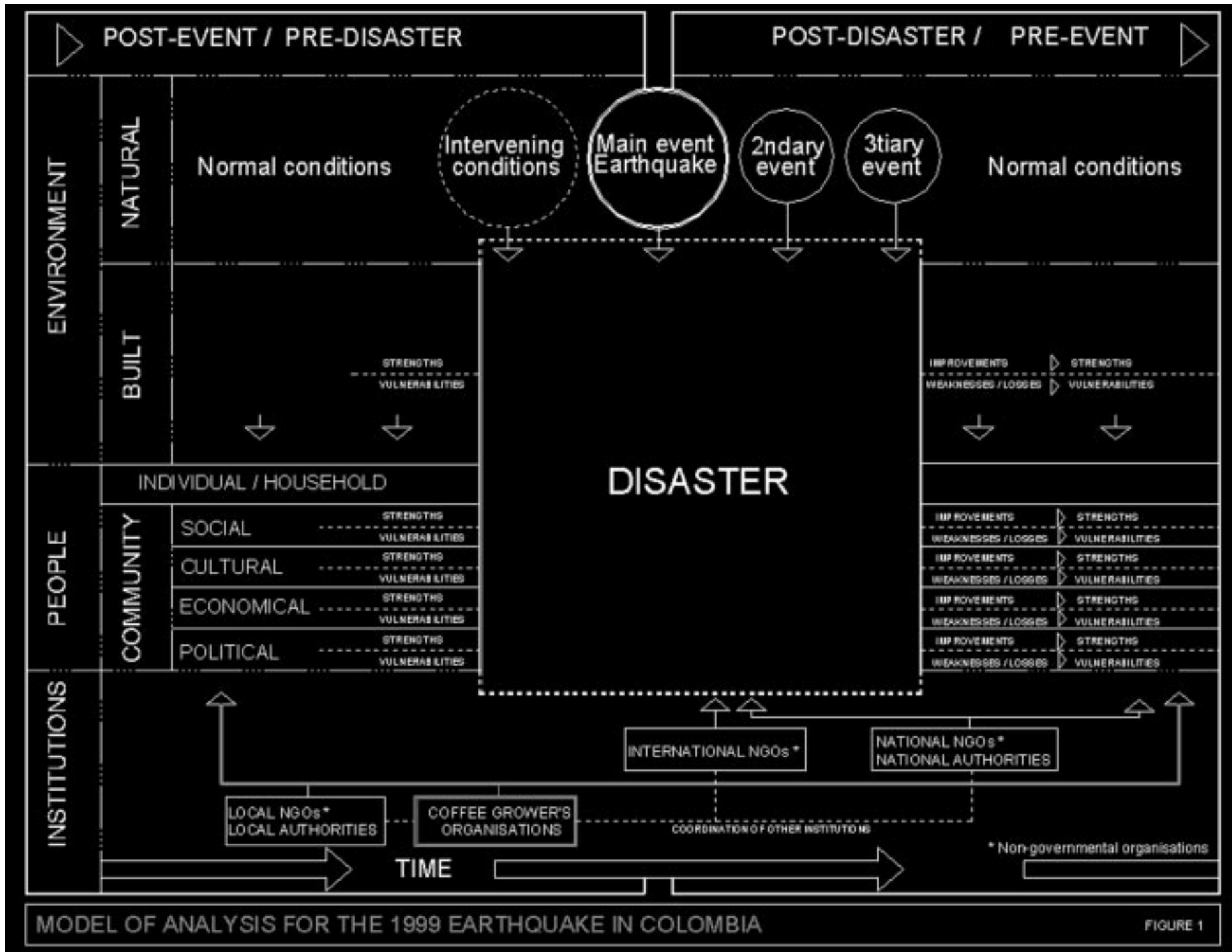
However, this section focuses on the analysis of time to facilitate the understanding the following aspects:

- The formation of the community's vulnerability and the development of adjustment measures.
- The importance of timing in the application of mitigation and adjustment measures.
- The responsibility of each of the institutions involved in each moment of the disaster (i.e. pre-disaster, disaster, immediate relief, rehabilitation, and reconstruction)
- Hazards as a cyclic process. Since hazards usually repeat in the same areas, improvements gained after disasters become the strengths of the community for the next event. At the same time, the weaknesses and permanent losses become vulnerabilities to next disasters.
- The different factors involved in each stage of the disaster, facilitating the evaluation of the process at any time.

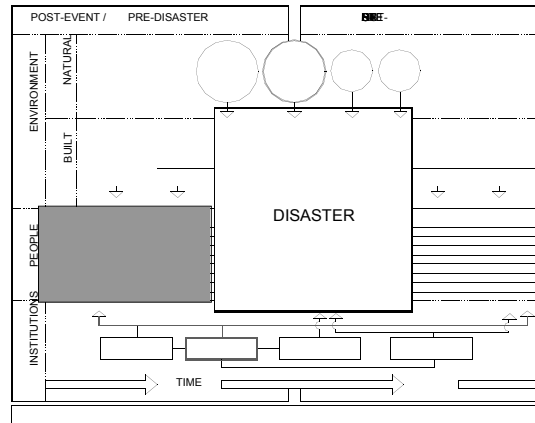
In the model, the disaster is presented as a **process over time** that involves the post-disaster stages of rehabilitation and reconstruction. The model presented here also suggests that disasters can eventually affect the natural environment and also affect both public and private institutions; however, those aspects are outside of the scope of the present research. The model studies the effects in the built environment (public and private), and on the community, with a special emphasis on the rural population.

Following the structure of the model, the analysis is divided in five sections:

- The national and regional context
- The natural environment: intervening conditions, the hazard, secondary and tertiary events
- The effects of the disaster.
- Analysis of vulnerabilities and strengths (coping and adjustments)
- Institutions: general measures taken after the disaster

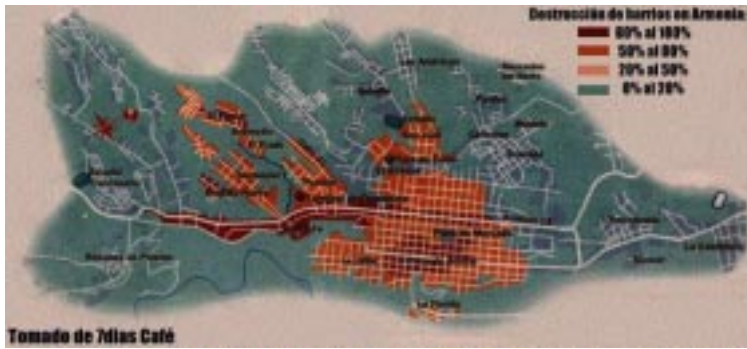


### 3.2. The national and regional context



Located in the Northwest corner of South America, **Colombia** has a population of nearly 38 million habitants. The main products are coffee, oil, flowers and bananas. The country is a democratic republic with a centralised government, geographically and politically divided into 'Departamentos' (Departments), 'Intendencias' and 'Comisarias'.





**3.1 Previous page left:** Aerial photo after the disaster. Armenia.

Source: [www.disaster.info.desastres.net/col-ops/Terremoto/Album.html](http://www.disaster.info.desastres.net/col-ops/Terremoto/Album.html)

**3.2 Previous page right:** Map of Colombia. Location of the disaster.

Source: <http://www.northrim.net/ccarter/mission/quake.html>

**3.3 Above:** Map of the city of Armenia. Shows in orange the neighbourhoods destroyed or seriously affected.

Source: [www.disaster.info.desastres.net/col-ops/Terremoto/Album.html](http://www.disaster.info.desastres.net/col-ops/Terremoto/Album.html)

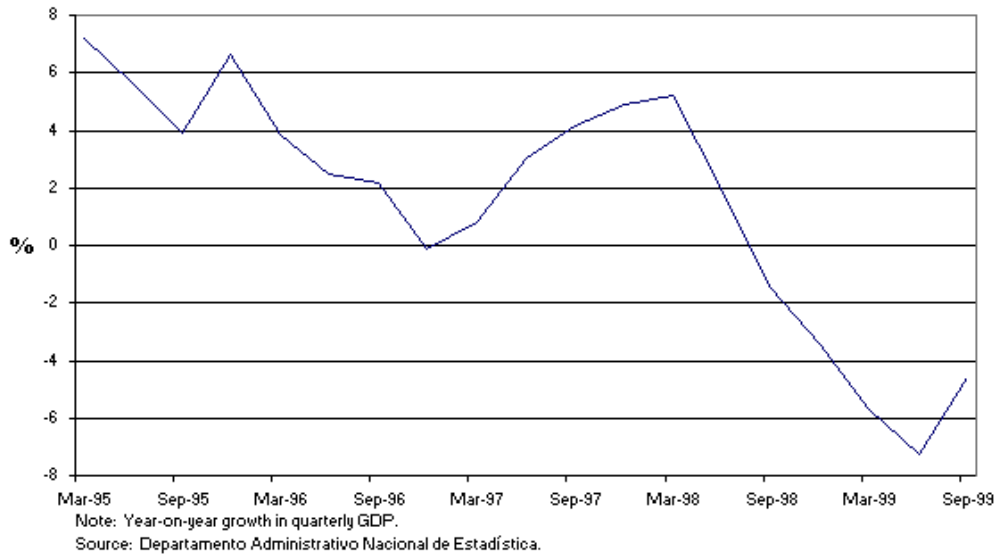
The disaster struck the country during a deep economic recession and a very complex internal security situation. The GDP (real growth rate) in 1998, just before the earthquake, was 0,2 %, decreasing since the beginning of the recession in 1996 (See Figure 3.4). This difficult moment for the economy was influenced at the same time by an elevated rate of inflation that during 1998 was close to 20 % calculated annually. (See Figure 3.5). The extremely high interest rates that in 1998 reached 35% annually (See Figure 3.6) forced a complete recession in the construction industry.

As another indicator of the macro-economic context before the disaster, Figure 3.7 shows the upward trend of the external debt of the country. Despite the elevated international debt, the country maintains a positive reputation in the economic balance of payments in the world community. In fact, following the disaster, the loans provided by the World Bank were important for the creation of the reconstruction funds.

The economic recession and unemployment influenced the reconstruction in two different ways: (i) they affected the recovery of the population and (ii) they created the expectation that the resources attracted by the disaster would reactivate the construction industry, helping to bring the economic recession to an end. However, in the department of Quindio, the unemployment rate rose from 12,1% before the disaster to 34,3% after it. Finally, the effects of the reconstruction were not enough to stimulate the national economy. (Fernando Umana, Café 7 Dias, January 21, 2000). Despite the small influence in the reactivation of the economy, the expectations derived from the disaster lead to a high level of participation of the private sector (especially construction companies), giving multiple alternatives to the community in the reconstruction process.

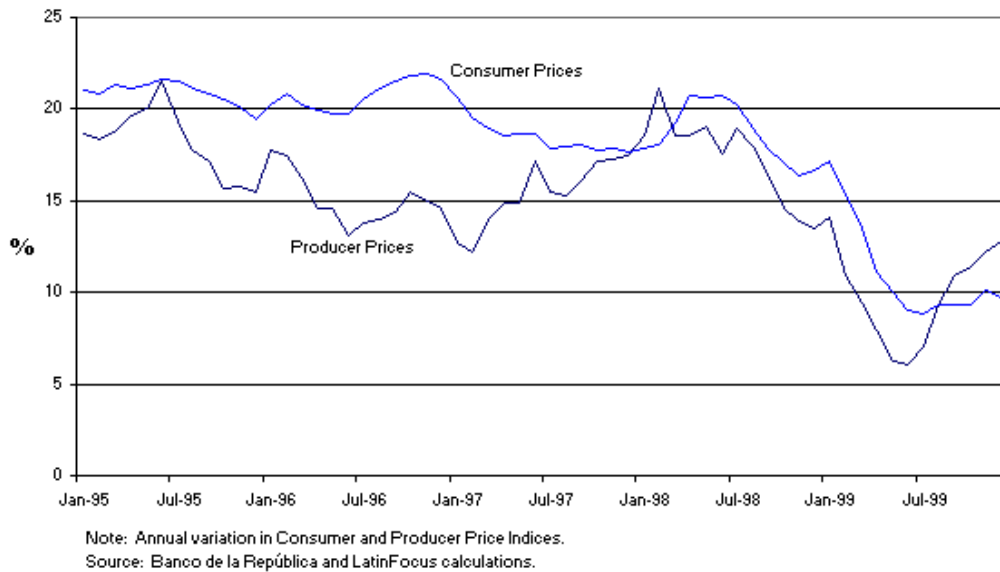
The earthquake struck one of the most important regions in the national economy - the coffee growing area (EERI, web page). According to Cepal, the disaster caused a decrease of 10 million dollars in exports in 1999 (Impacto...P. 18). As the main exportation product by the country is coffee, the disaster called for the attention of the central government and national organisations. The recognised importance of the agriculture industry of the region actually benefited the local rural communities as special consideration was placed on the assistance of these groups.

**Gross Domestic Product Growth, Q1 1995 - Q3 1999**



**Figure 3.4** Source: Departamento Administrativo de Estadística. DANE Colombia. Posted in the Internet by Latin Focus. <<http://www.latin-focus.com/countries/colombia.html>> February, 2000.

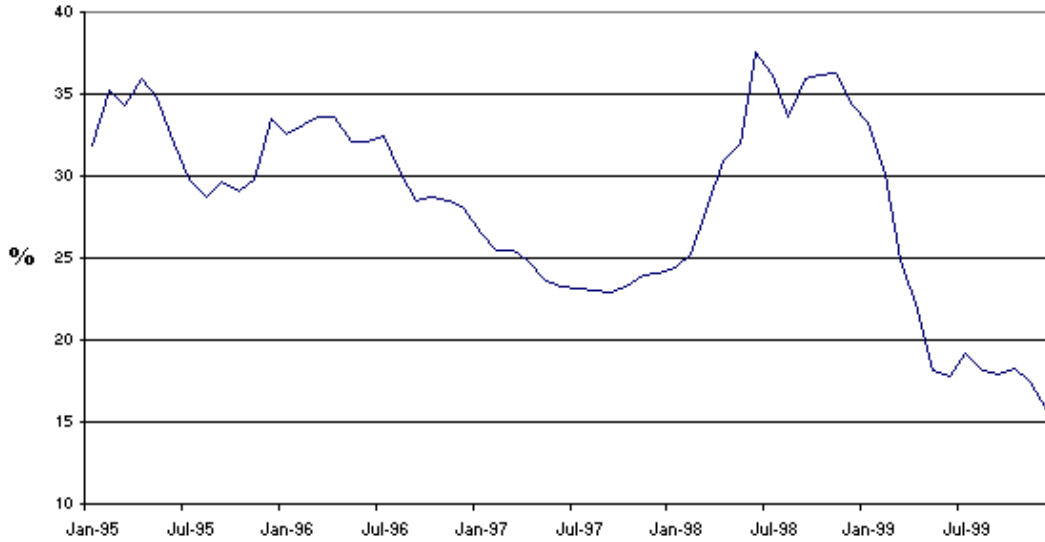
**Consumer vs. Producer Prices, January 1995 - December 1999**



**Figure 3.5** Source: Departamento Administrativo de Estadística. DANE Colombia. Posted in the Internet by Latin Focus. <<http://www.latin-focus.com/countries/colombia.html>> February, 2000.



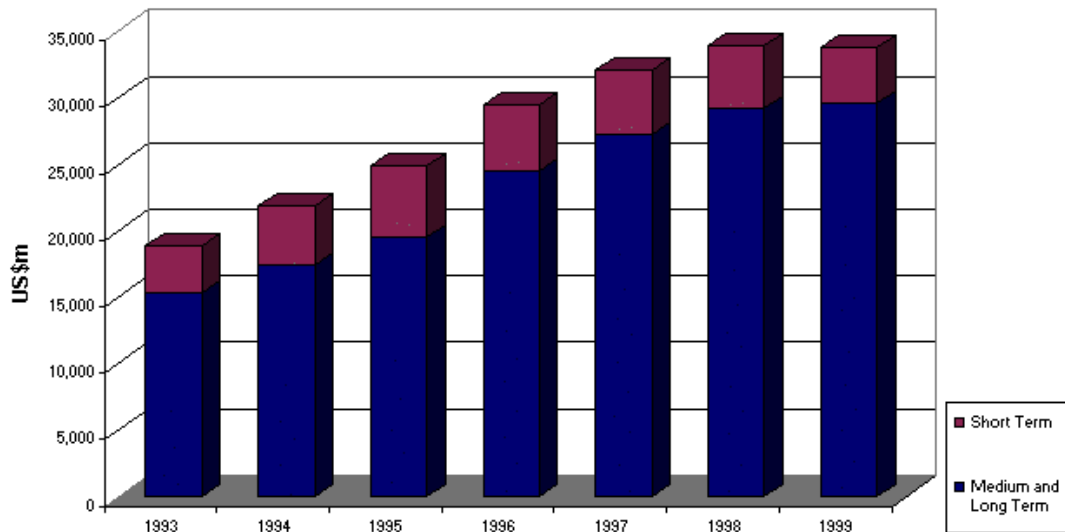
**Interest Rates, January 1995 - December 1999**



Note: End-of-month DTF 90-day.  
Source: Banco de la República.

**Figure 3.6** Source: Departamento Administrativo de Estadística. DANE Colombia. Posted in the Internet by Latin Focus. <<http://www.latin-focus.com/countries/colombia.html>> Februaury, 2000.

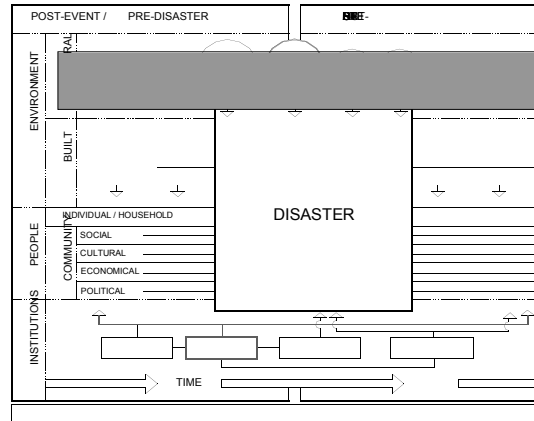
**External Debt, 1993 - 1999**



Source: Banco de la República.  
Note: 1999 represents Q3 data

**Figure 3.7** Source: Banco de la Republica Colombia. Posted in the Internet by Latin Focus. <<http://www.latin-focus.com/countries/colombia.html>> Februaury, 2000.

### 3.3. The natural environment. Normal conditions, main event, secondary and tertiary events.

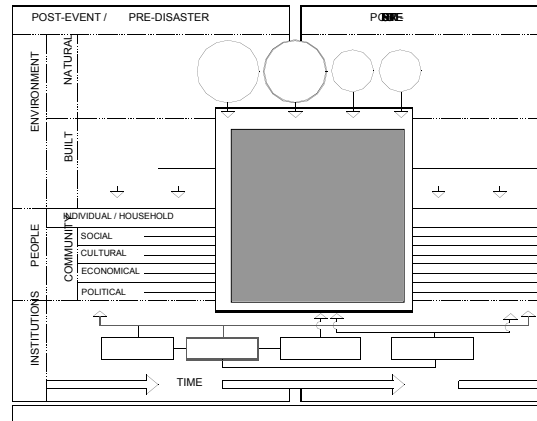


The area affected is, according to Hansjürgen Meyer, ex-director of Osso (South-west Seismic Observatory), “the zone with most seismic risk in the country and one of the most dangerous in the continent” (Cuando la ... Cambio. P.20). It is a ‘young’ mountains region still in formation, created by the intersection of three tectonic plates. The frequency of seismic activities is increasing in Colombia. Between 1900 and 1980 there was almost one earthquake every decade, in the eighties there were two events, and in the nineties, seven. According to Meyer, “Before one decade, another earthquake like the one in 1999 will occur in the same area” (Cuando la ... Cambio. P.20).

The main event, the earthquake (6.2 on the Richter scale) occurred at 1:19 p.m. local time on January 25, 1999. The epicentre was located 17 km south of Armenia and 48 km south of Pereira (EERI, web page). A secondary event, also an earthquake,

occurred later at 5:30 p.m. measuring 5.8 on the Richter scale. Tertiary events included 138 aftershocks spread over one month after the main event.

### 3.4. The effects of the disaster.



The Colombian Red Cross reported a total of 1,171 confirmed deaths and 4,765 injuries. Furthermore, the Colombian Centre for the Study of Social Development (CENDES) calculated that 425,000 people were affected, including 35,000 families or approximately 150,000 people, who have been left homeless as a result of the earthquake. (EERI web page). The disaster is the sixth most harmful (in human losses) in the world in 1999, with direct damages calculated in 1,66 billion dollars. (Impacto...p. 15).

With a large area devoted to the built environment, the model of analysis suggests that one of the most affected sectors was housing. The following statistics illustrate the proportion of damages in that sector:

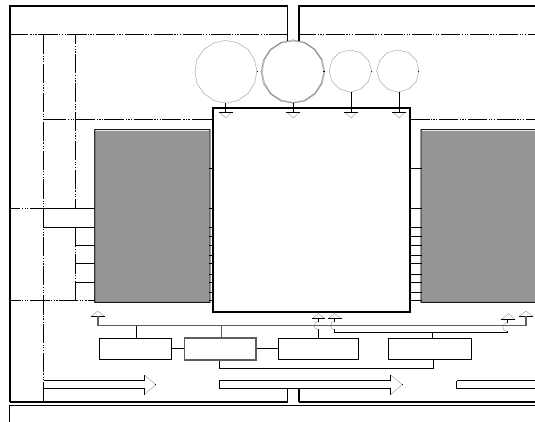
- The damages in housing represent the 25 % of the regional GDP, while the total of damages represent 35 %. (source: CEPAL. Published by Newspaper *La Tarde*, July 26, 1999 page 6a)
- 1,800 families required immediate relocation after the earthquake. (Published by Newspaper *La Tarde*, July 26, 1999 page 6a).

- More than 16,000 tenants were affected by housing damages in the affected area. (Published by Newspaper *La Tarde*, July 26, 1999 page 6a).

Effects in lifelines (see glossary) affected the mitigation and adjustments measures.

These effects included: two electrical substations damaged in Armenia, damage to Calarca's water infrastructure (Quindio), and landslides affecting roads (4 roads blocked for 4 days in Quindio, and about 100 landslides on the road between Armenia and Pijao). Furthermore, 3 of the 12 health care centres in Armenia could no longer provide services. This city was also affected by the failure of the telecommunications system (Telecom).

### 3.5. Analysis of **vulnerabilities** and strengths (coping and adjustments)



According to the model proposed, the causes of vulnerability are classified in two main and four secondary groups: (i) the built environment, (ii-a) community level – social, (ii-b) community level-cultural (ii-c) community level – economical, and (ii-d) community level – political.

**The built environment:** Since colonisation in the nineteenth century, favourable conditions for agriculture have increased rural settlements in the mountainous areas of the region. However, construction on hills and unstable land, along with lack of proper foundations, were responsible for the destruction of many buildings (EERI, web page). Discontinuous structures combined masonry with 'bahareque' (mix technology of 'guadua' and mud) walls and created weak structures that were seriously affected in the earthquake. Also, lack of maintenance in the structures and the roofs caused the collapse of many dwellings built with traditional technologies. In many cases, this insufficient maintenance resulted in the collapse of heavy clay tiles (Robledo, P. 16). Most of the structures affected were built before 1984. In that year the building codes included policies and requirements for seismic resistance. (*De los corazones...* P.2). Regarding public infrastructure, the insufficient capacity of the local airports limited the speed and arrival of external aid.

**Community level – social:** The lack of food in some areas increased vandalism and crime. In some cities, intervention by the police and the army was necessary. The unorganised management of resources in the main cities made it difficult for the distribution of international aid and resources.

**Community level- cultural:** In the majority of disasters the cultural aspects (such as religion believes, ideologies, and traditions) have an important role in the vulnerability of the affected community. The model includes a space for the report of such aspects, however, due to the limitations to conduct an appropriate anthropological and sociological analysis, the cultural vulnerabilities are considered out of the scope of this research.

**Community level – economical:** As explained before, the macro-economic situation limited the recovery of the local economy and employment opportunities. Moreover, it is expected that a reduction of US \$10 million in exports, an increase in imports equivalent to US \$ 93 million and losses in the productive sector equivalent to 4.2 % of the regional GDP will take place. These aspects affect directly both the local and national economy. (Cepal. *Impacto...* P.17). According to some reports, the economy and unemployment in cities such as Armenia have not recovered (“El eje siglo XXI” Newspaper. July 26, 1999.).

**Community level – political:** lack of information and knowledge was an important aggravating factor of the disaster. A research project developed by seismic scientists to study the region, make the population aware about the risk, and improve the knowledge for disaster preparedness, did not receive funds from the government. Also the project received little attention from the central authorities and municipalities. According to the scientists, the disaster was predictable because of the high seismic risk of the area and the increasing frequency of seismic events (“Cuando...*Cambio*. P. 25).

On the other hand, the community tried to cope before external institutions started to participate. Initial search and rescue activities were performed by uninjured survivors and later continued by professional personnel within the region. Finally, local groups were assisted by numerous international teams. As temporary housing became a critical problem in Armenia, initial shelter was spontaneous and without any organisation. Affected families constructed makeshift shelters on sidewalks or parks near the destroyed properties.

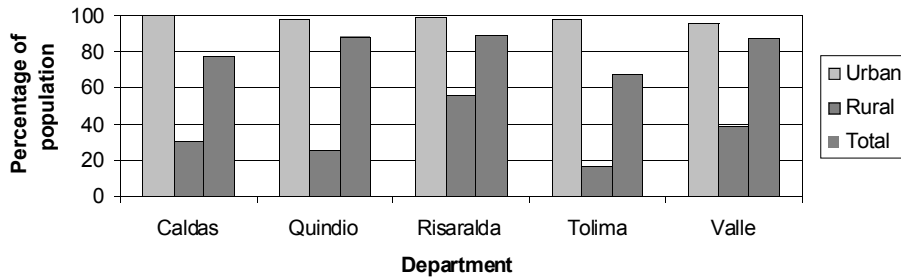
## **The rural case**

The general economic situation of the country affected all productive sectors nationwide. However, due to the specific conditions of the rural population, this community could be expected to be the most vulnerable in the case of a disaster. Some characteristics of the rural communities in Colombia are:

- Lack of proper access roads to the rural areas
- Lack of a wide coverage of public services
- Lack of education (including high levels of illiteracy)
- Poverty
- Lack of political influence and social isolation in some cases
- Difficulties in receiving information, and little access to knowledge
- Settlements are located in unsafe areas; usually on slopes and in proximity to water resources (therefore prone to floods)
- Lack of building codes and construction supervision

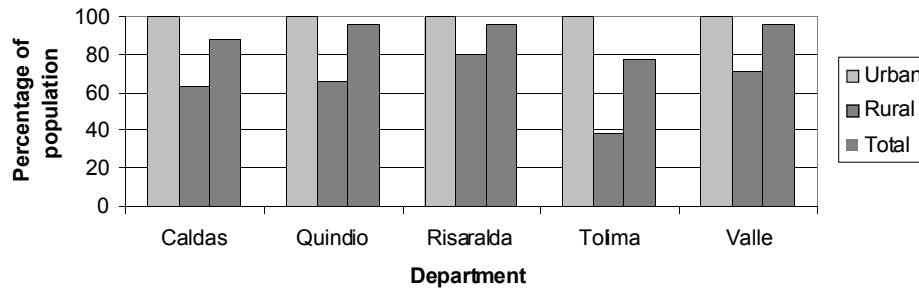
The disadvantageous conditions of the rural population, when compared with the urban standards that prevail in urban areas, can be easily correlated to the availability of public services as presented in Figures 3.8, 3.9 and 3.10. The Figures show that the level of services infrastructure, in the five departments affected by the earthquake is always inferior in rural areas. However, the wide availability of public services in urban areas also explains large losses in infrastructure during the earthquake. Direct damages in infrastructure reached almost 49 million US dollars. (Cepal. Impacto...p. 15)

**Percentage of the population connected to sewage system in 1997**



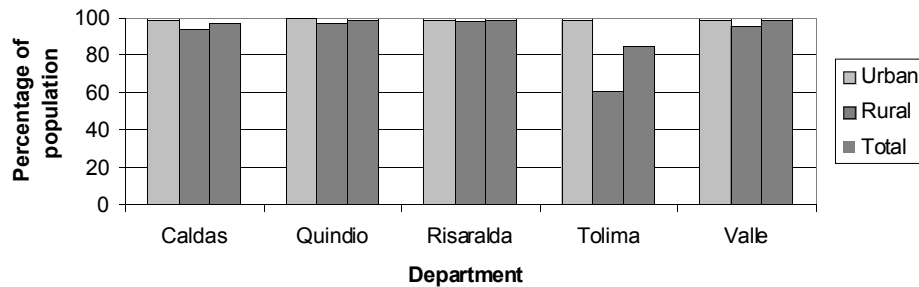
**Figure 3.8** Source of Data : Oficina Doctora Nohra Puyana de Pastrana. Presidency of the Colombian Government. Fax. Feb. 1999. Graphics : Gonzalo Lizarralde.

**Percentage of the population connected to water supply system in 1997**



**Figure 3.9** Source of Data : Oficina Doctora Nohra Puyana de Pastrana. Presidency of the Colombian Government. Fax. Feb. 1999. Graphics : Gonzalo Lizarralde.

**Percentage of the population connected to electricity service in 1997**



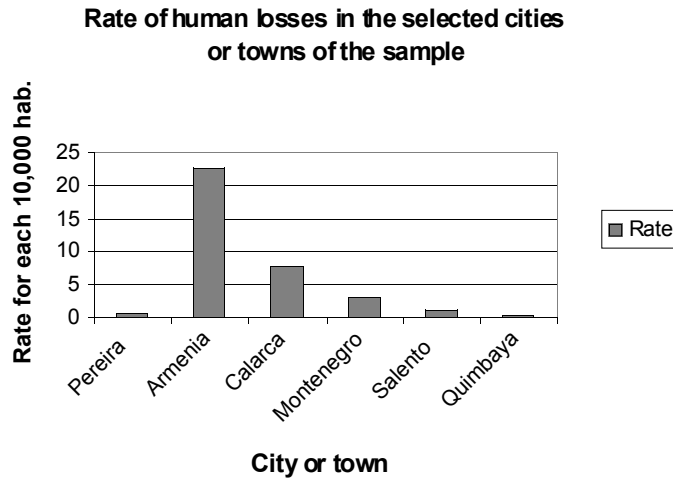
**Figure 3.10** Source of Data : Oficina Doctora Nohra Puyana de Pastrana. Presidency of the Colombian Government. Fax. Feb. 1999. Graphics : Gonzalo Lizarralde.



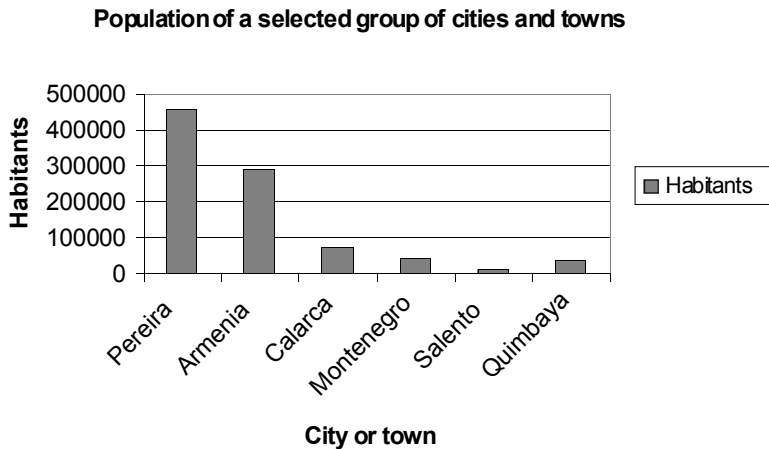
The density of buildings in the settlements has a considerable impact on the effects of disasters. However, it is not always accurate to argue that larger cities are supposed to suffer more damages than small ones. Some characteristics of the built environment (such as the maintenance of structures) and obviously the proximity to epicentre, may cause differential effects in a sample of cities and towns. This was the case in the Colombian disaster; a concentrated number of human losses took place in the city of Armenia, a city seriously affected due to its proximity to the epicentre. The comparison of Figures 3.11 and 3.12 illustrates the greater effects of the disaster in Armenia, Calarca, Montenegro and Salento when compared with the city of Pereira (larger in population but further from the epicentre).

The effects of disasters in rural and urban areas are usually different. While the higher densities in cities lead to concentrated damages and dramatic building collapses, the rural effects are dispersed. Damages to individual housing usually receive little coverage by the media as they are less impressive than urban losses. Therefore, to evaluate the effects of disasters based on individual evaluations of scenes in cities is not always accurate, especially for the development of a rural housing program.

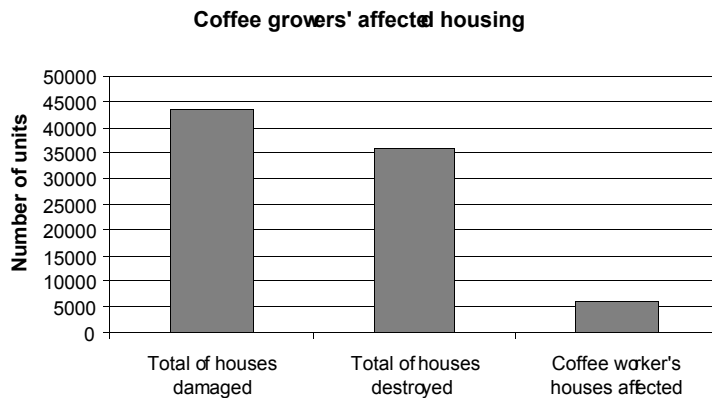
When the cases are seen individually, the small towns were proportionally less affected. However, Figure 3.13 shows that the total number of housing units concerning the rural coffee workers affected in the earthquake is large. This sector alone represents almost 8% of the total number of houses affected by the earthquake.



**Figure 3.11** Source of Data : Departamento Administrativo de Estadística. DANE Colombia. Published by Newspaper *La Tarde*, July 26, 1999 page 8a. Graphics : Gonzalo Lizarralde

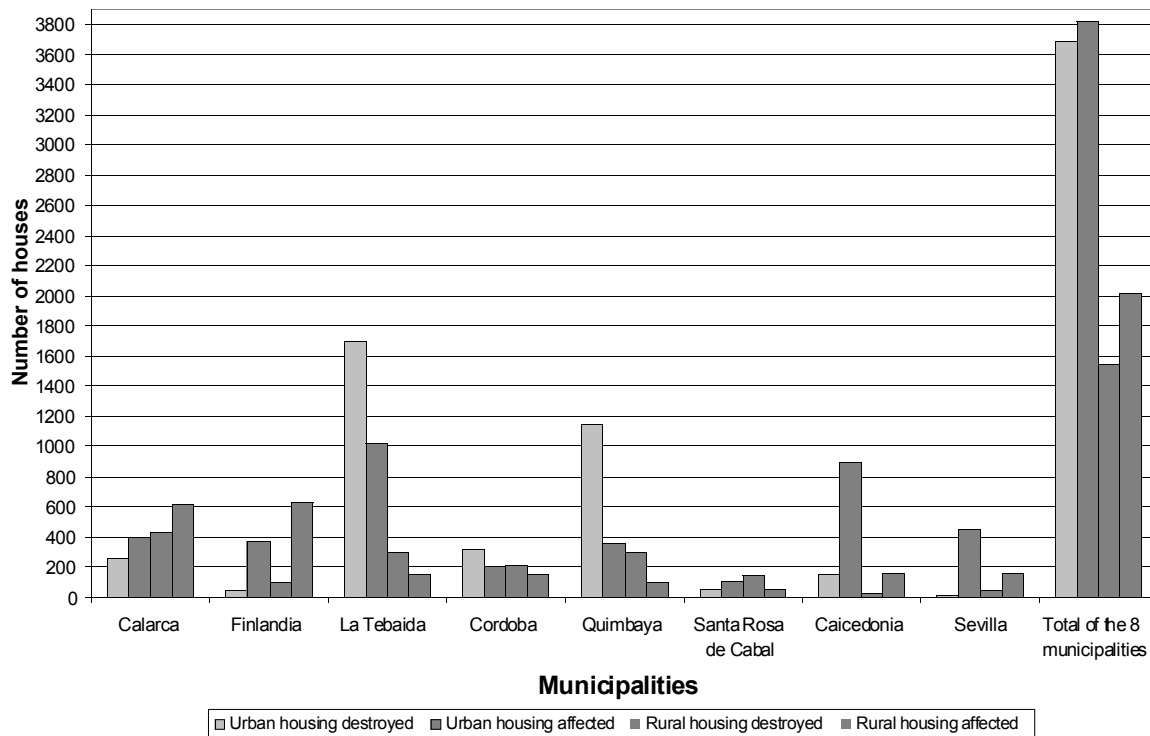


**Figure 3.12** Source of Data : Cuevas, Adriana. “Como respondió el Sistema para la prevención y atención de desastres.” *Revista Avance y desarrollo* 1999: 11-20. Graphics : Gonzalo Lizarralde



**Figure 3.13** Source of Data : Federación Nacional de Cafeteros. Published by Newspaper *La Tarde*, July 26, 1999 page 8a. Graphics : Gonzalo Lizarralde

**Distribution of affected housing in a sample of municipalities**



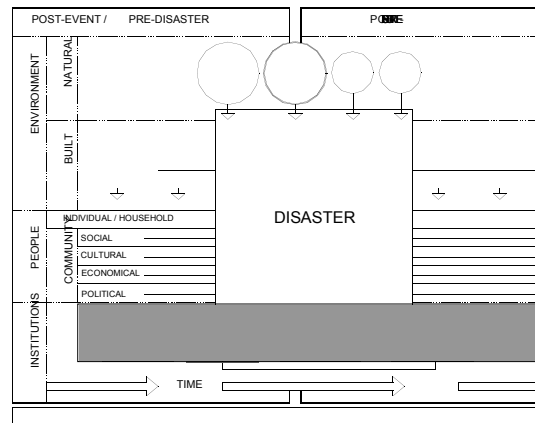
**Figure 3.14** Source of Data : Cuevas, Adriana. “Como respondió el Sistema para la prevención y atención de desastres.” *Revista Avance y desarrollo* 1999: 11-20. Graphics : Gonzalo Lizarralde

Figure 3.14 illustrates the numbers of houses affected and destroyed in rural and urban areas in a sample of eight municipalities. Important aspects for the understanding of the rural case can be drawn from the figure. Each municipality had the participation of two reconstruction programs, one devoted to meet the damage in urban housing (bars in light and dark grey) and one to meet the damage in rural housing (bars with lines' texture). To meet the urban reconstruction, one NGO was assigned in charge of each municipality (i.e., the NGO “*Fenavip*” was assigned the municipality of Calarca, “*Camara Junior*” the municipality of Finlandia, “*Antioquia presente*” the municipality of La Tebaida, and so on). However, to meet the rural reconstruction of all municipalities just one NGO was assigned: The Coffee Growers’

Federation. The figure illustrates the ambitious agenda of the rural reconstruction when compared with the reconstruction of the other NGOs assigned to each municipality. When summed up, the cases in the rural area were plentiful. As opposed to a high density urban situation, approaching a rural reconstruction program requires one to understand the effects of destruction in the larger context of small towns and widespread settlements.

Five relevant **strengths** of the rural population influenced the reconstruction stage and therefore are crucial to understanding the housing program reported in the next chapter. Considering that the economy is based on small industries supported by coffee growing, farmer's land-ownership is frequent in the rural communities. The normal rural economic activity already requires community interactions and it turns out that they are important for the creation of community based coping strategies. As a great percentage of the rural community shares the same economic activity, it has similar needs and common interests. These aspects are important for the diffusion of coping programs. Finally, the community can be considered homogeneous in terms of education, economic level, costumes and cultural traditions. This characteristic creates a situation where just a few programs can reach most of the community.

### 3.6. Institutions. General measures taken after the disaster



Local, national, and international institutions played an important role in the disaster and in the pre- and post-disaster stages. As shown in the model, local NGOs and local authorities participated not only after the disaster, but also were responsible for the strengths and vulnerabilities building up in the pre-disaster stage.

The rural communities received little participation from the national NGOs or national authorities before the disaster. However, as explained before, the measures taken by the central government and the participation of the private sector was relevant in the reconstruction process. Even though international NGOs, such as United Nations Food program, Red Cross International, and OFDA, only participated immediately after the disaster. (In fact they left the area after short-term evaluation periods of one to two months), the financial help of the World Bank will continue to support the reconstruction program in the long-term.

Two national institutions assumed the general co-ordination of the disaster assistance activities: the Presidency and the DNPAD (National Direction for the Prevention and Attendance of Disasters). The role of the DNPAD included the daily collection and distribution of almost 1 million food rations during the first weeks, and the creation of 87 communal kitchens. In the field of temporary shelters its activities included the distribution of 2,000 tents and 45,200 square meters of plastics. The DNPAD took measures to guarantee the air transportation of injured people, the transportation of medical personnel, and the installation of public bathrooms. (Cuevas, p. 17). These measures were important to support a successful health and sanitation program. Other measures promoted by DNPAD included specific programs of assistance of infants, evaluation of damage and needs, removal of debris, psychological assistance, optional evacuation, public security and the initial co-ordination of international aid organisations.

The principal activity directed by the Presidency, was the creation of a general fund for the disaster, called FOREC (Fondo para la Reconstruccion del Eje Cafetero) and the development of a reconstruction program that involved the participation of thirty-two national NGOs. The following chapter reports on the participation of the Coffee Growers' Organisations in that reconstruction program.

## Chapter four - Case Study

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**Reconstruction program developed by Coffee Growers' Organisations.**

**Linked to the reconstruction directed by the Presidency, a parallel program was developed by the Coffee Growers' organisations. The program, with an ambitious housing agenda, illustrates the importance of the articulation between the 'physical' and the 'soft' factors of reconstruction.**

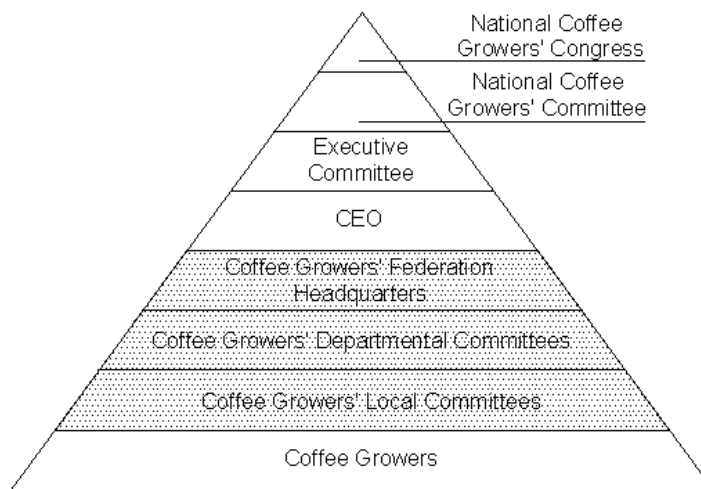
### **4.1. Introduction**

In 1927 a group of coffee workers created a guild or federation to reinforce their mutual aid called "Federacion Nacional de Cafeteros de Colombia". The Federation is a non-profit co-op without political interest that stabilises the Colombian coffee market.

Under the supervision of the Colombian Government, and financed through a tax on coffee exportations, the Coffee Growers' Federation protects coffee producers by buying and selling their product. This mechanism guaranties to the coffee growers a regular income during the year. The CGF develops programs of social assistance, research, promotion, infrastructure, loans and market studies. It also controls the quality of the product, defending the interest of 300.000 small-scale independent workers (source: [www.juanvaldez.com](http://www.juanvaldez.com))

The CGF has a hierarchy of organisations at different scales; national, departmental and local (municipal) committees. The following figure illustrates the CGF's institutional structure. In the present report, Coffee Growers' Organisations refers to

the institutional group formed by the CGF and its Departmental and Local Committees (see shadowed areas).



**Figure 4.1.** Institutional structure of the CGF. (Source: Federacion Nacional de Cafeteros de Colombia)

Soon after the disaster, the CGF and Coffee Growers' Departmental Committees took measures to mitigate the effects of the earthquake. Their activity was oriented to help distribute external aid, reactivate the industry, re-establish conditions for the collection of the season's harvest, and prevent migration to main urban areas.

Considering the limitations of the CGF's infrastructure in the urban areas, the CGF decided to concentrate its aid in **rural sectors**, where coffee production farms are located (Federacion - Actualidad, p. 5).

According to the United Nations, each case can be analysed through three periods after the disaster: (i) the immediate relief, (ii) the rehabilitation and (iii) the reconstruction (UNDRO, p. 5). The measures taken by the Coffee Growers' Organisations were targeted mainly in the second and third post-disaster periods



proposed by UNDRO. The more relevant activities and outputs in the rehabilitation and the reconstruction were:

Rehabilitation period

1. Tents
2. Temporary shelters
3. Food distribution
4. Rural infrastructure

Reconstruction period

1. Funding
2. Housing
3. Industry structures
4. Infrastructure
5. Community services
6. Information
7. Education and technical assistance

The CGF **is not** a disaster-assistance organisation, but seeks to defend the interest of the guild. Therefore, it was not in a position to assume all the required roles of rehabilitation and reconstruction. Instead, the CGF co-ordinated national and international organisations and resources to guarantee the assistance of the peasant coffee workers.

The measures taken by the CGF not only were targeted to an important productive sector of the economy, but also to one of the most potentially vulnerable communities. As explained in chapter three, the level of poverty, the lack of education, lack of support from the government, and lack of adequate transportation systems, etc. could have amplified the consequences of the disaster in the rural sector. At the same time, as it was previously pointed out, the coffee growers and producers are a strong group in dealing with problems, community interactions, common interests, and social homogeneity. Therefore, the program had three important challenges: (i) to assist a

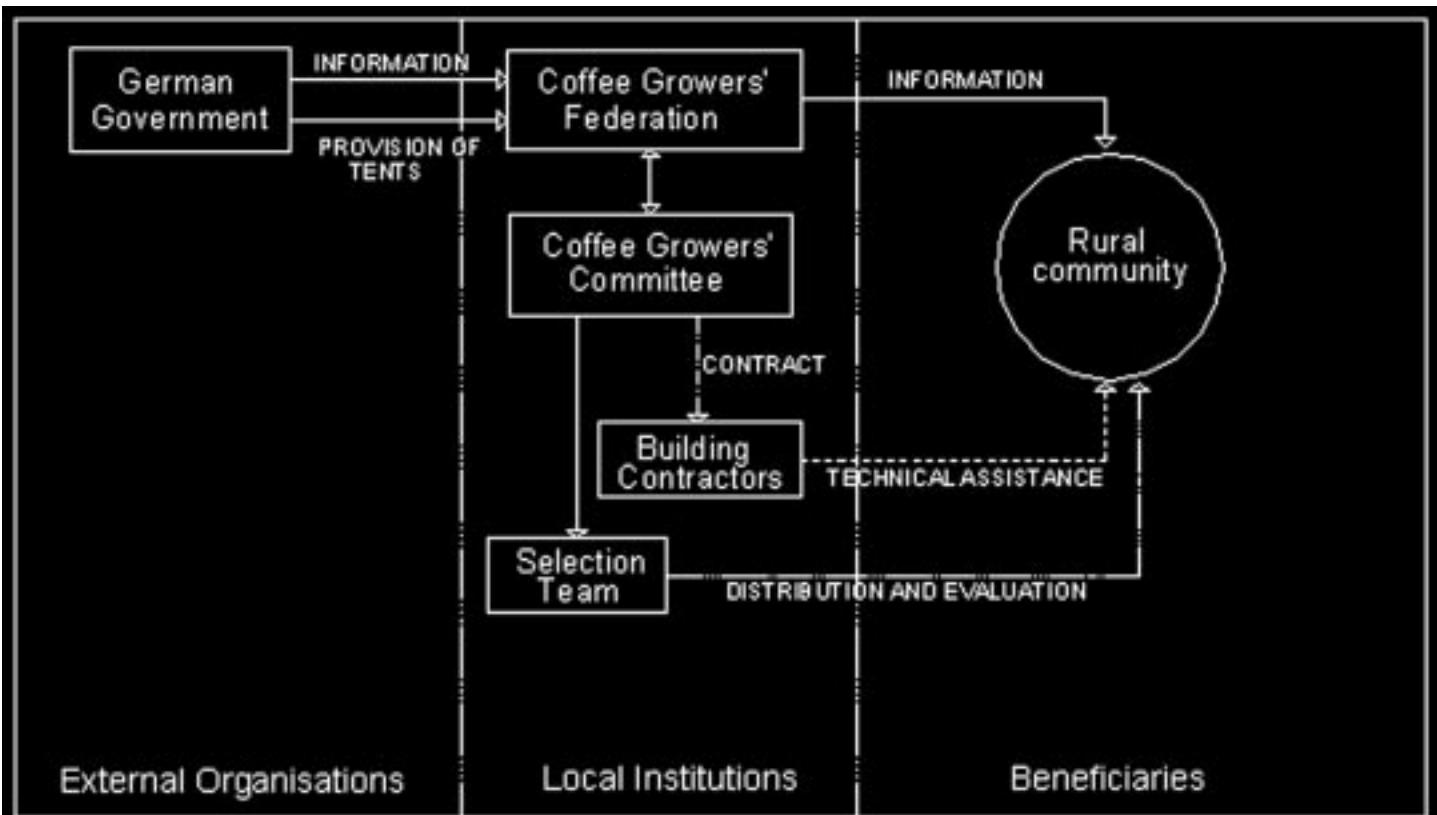
relevant sector of the economy, (ii) to assist a group with potential weaknesses to affront the disaster and, (iii) to use and reinforce the values and capabilities of the community.

The organisational charts (1 to 5) illustrate the relations of the different institutions involved, their activities, and the products offered to the community. The type of relation is specified in each link (i.e. provision of goods, management, distribution, technical advice, information, evaluation, labour force provision, and diagnosis).

## **4.2. Rehabilitation period**

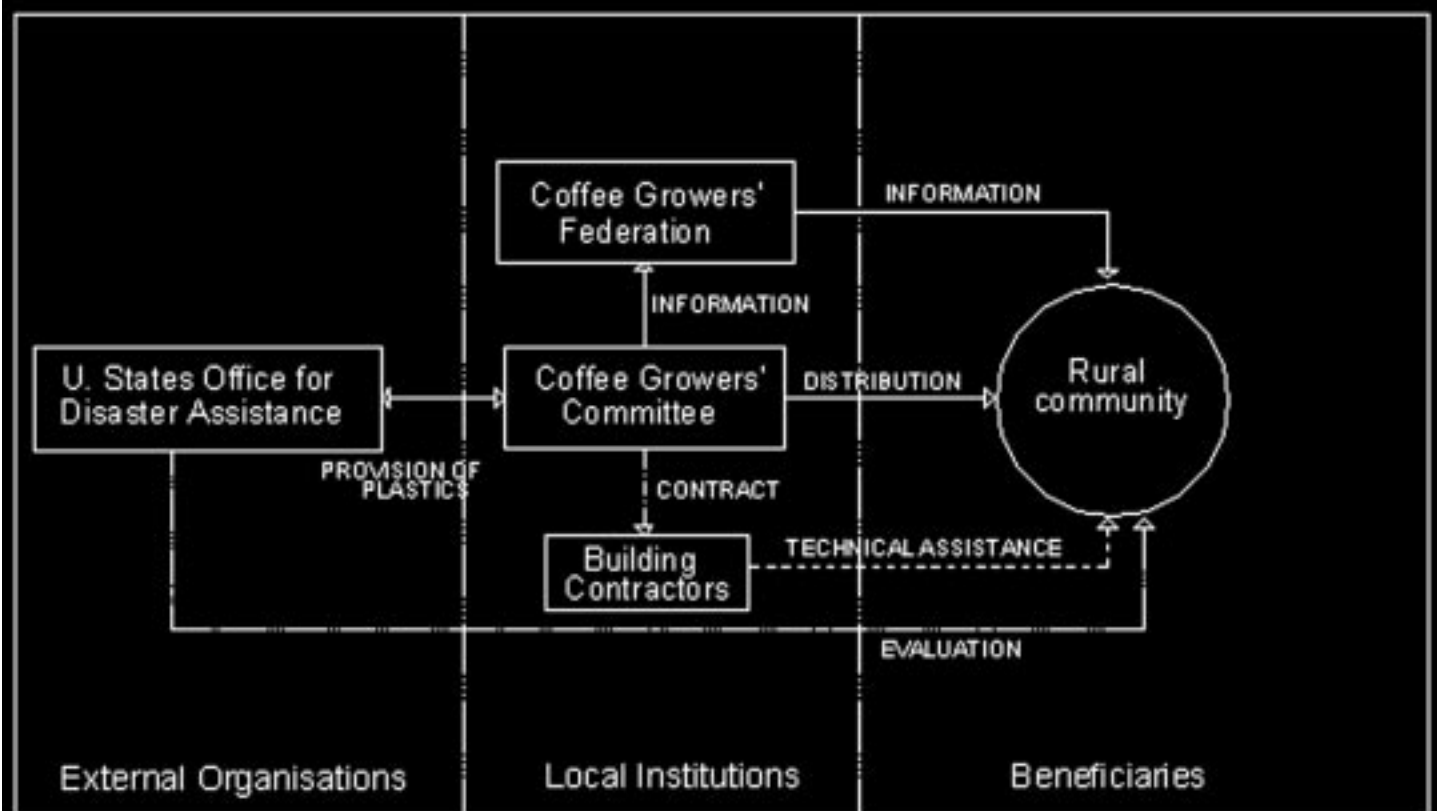
In the mitigation of immediate needs, Coffee Growers' Organisations brought in aid in the form of shelter, food, and infrastructure. For shelter, the CGF acquired, through negotiation with the German Government, 800 tents to lend to coffee growers' families. The provision of tents was complemented with technical assistance to build them and construction workers were hired by the CGF to assist the victims in the process of installation. (See chart 1)

Through community participation programs, the Coffee Growers' Organisations established links between external institutions and the victims. Such is the case of the distribution and installation of the special emergency plastics donated by OFDA (American Government's Office for Disaster Assistance) for the construction of temporary shelters. In this program, where 150 small farms benefited, coffee growers contributed with their labour and supplementary materials. Led by the Quindio's



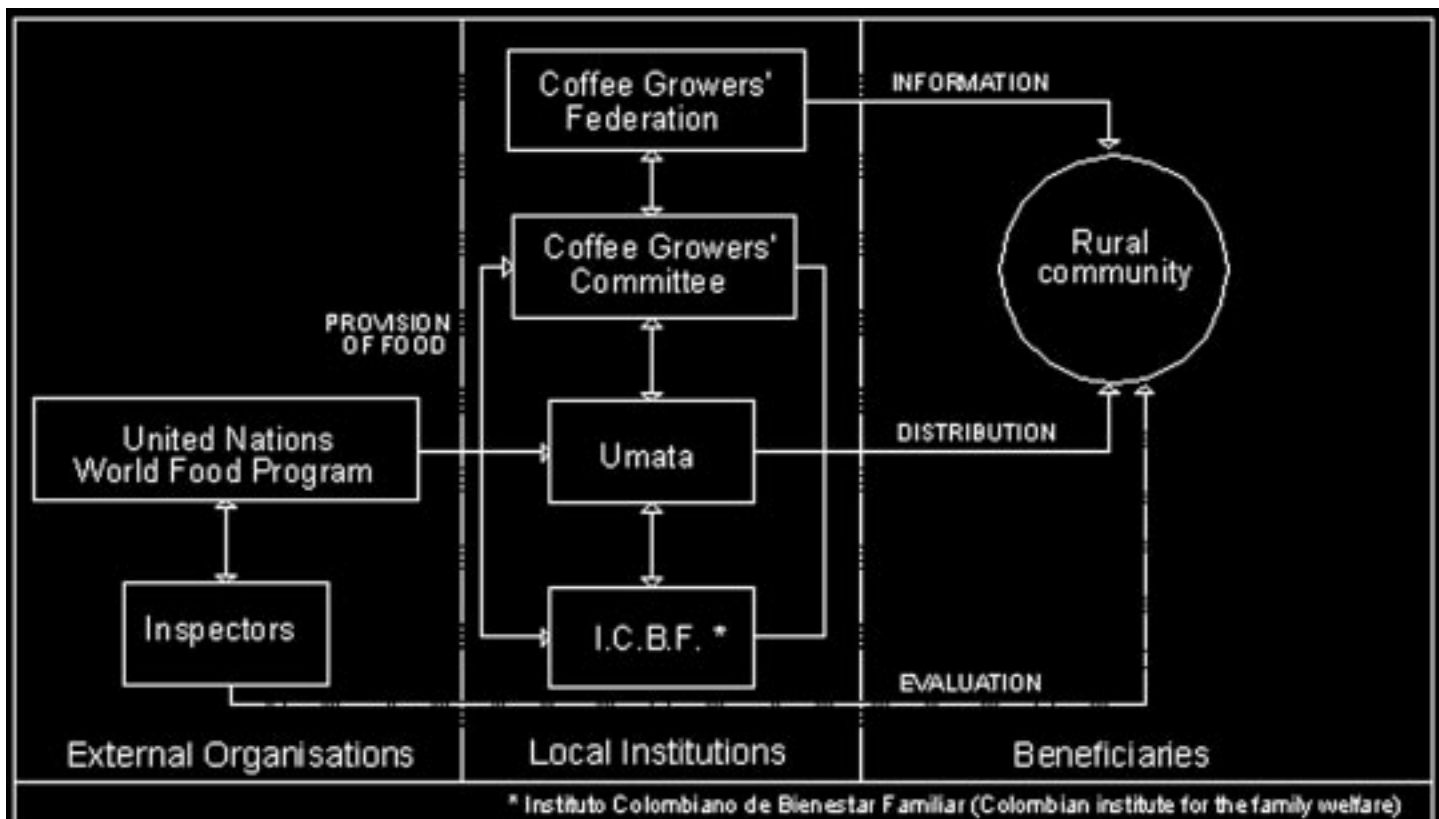
Organisation Chart 1

TENTS



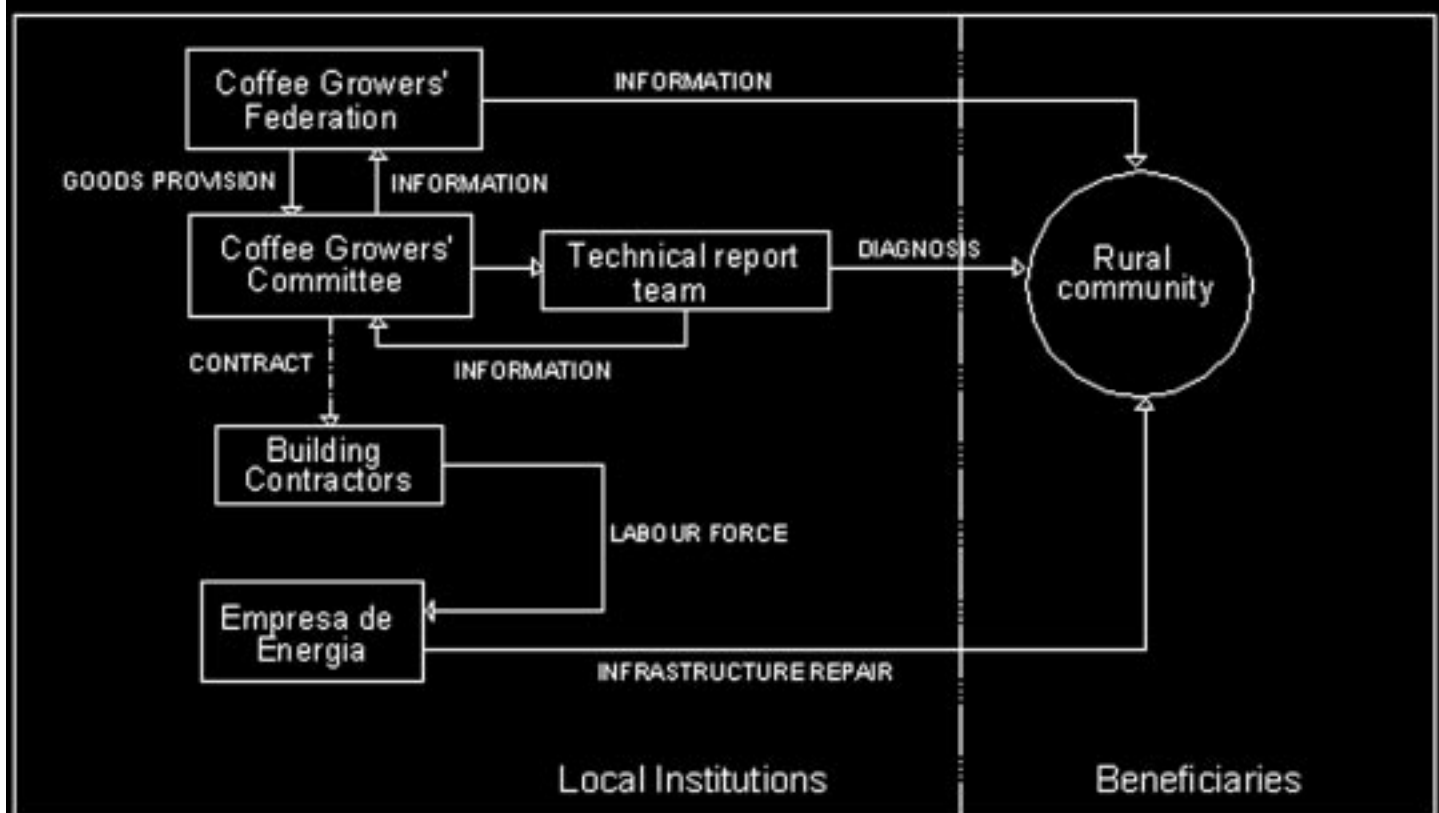
Organisation Chart 2

TEMPORARY SHELTERS



Organisation Chart 3

FOOD DISTRIBUTION



Organisation Chart 4

INFRASTRUCTURE REPAIR

Coffee Growers' Committee, contractors were hired to bring technical support to victims in the installation of the plastics. (See chart 2).

Shelter was not the only concern of the Coffee Growers' Organisations. During the first month, the Quindio's Committee contributed with "UMATA" and "ICBF" (a Colombian Institution involved in social aid programs), to the distribution of 25,000 food rations donated by the United Nations World Food Program. (See chart 3)

At the same time, to repair rural infrastructure, the CGF and Departmental Coffee Growers' Committees co-ordinated their own resources, the labour force and official entities such as the "Empresa de Energia" (Company in charge of the provision of electricity). The results helped to mitigate the damage to sewage, water, electricity and communication systems. (See chart 4)

### **4.3. Reconstruction period**

The following section analyses the programs of the Coffee Growers' Organisations in the reconstruction period. As well as the rehabilitation activities, the reconstruction program attempted to deal not only with the 'physical' needs of the victims (shelter, money, food, etc.), but also with 'soft' factors such as community organisation and participation, education, decision-making, information, employment opportunities, and economy reactivation. This section highlights important aspects related with the architectural design of the residential units.

#### **4.3.1. Census**

Soon after the disaster, in order to assess the magnitude of the damages, and determine the aid needed, the CGF conducted a census of affected coffee growers' farms in the five departments (i.e. Caldas, Quindio, Risaralda, Tolima, Valle).

According to the census, 6,648 houses needed to be reconstructed and 2,972 coffee industry structures needed to be repaired. (Café 7 Dias, April 23, 1999 p. 17).

#### **4.3.2. Management of resources**

According to the Economic Commission for Latin America and the Caribbean, "Cepal", in the article "Impacto Socioeconomico del terremoto en el eje cafetero" the damages caused by the disaster amounted to 2.1 billion US dollars. (El Espectador, 25 de Enero, 2000, p. 9-a). The intervention of the State is estimated in 1,7 billion pesos, through a fund called FOREC, "Fondo para la reconstrucción del eje cafetero", lead by the Presidency. The fund was created from resources of the National Budget, from donations, and from the financing of the World Bank.

The Colombian government, as is the case of many public institutions in developing countries, is frequently associated with extreme bureaucracy, slow procedures, corruption, and inefficiency. However, in this situation and in order to efficiently administer the resources, the government opted for an institutional structure that involved the participation of the private sector. The affected area was divided in 32 zones or regions, and reliable NGOs, (all non-profit institutions) with the most effective management infrastructures were selected to administrate each zone. According to Luis Carlos Villegas, president of the FOREC counsel, the adoption of such an

institutional model had the following objectives (El Espectador, January 25, 2000.

p.9a):

- Eliminate intermediate officers (and therefore intermediate procedures)
- Guarantee the transparency of the decisions
- Reinforce democratic systems and social organisation
- Prevent improvisation
- Consolidate opportunities for “peaceful social participation”

Each NGO received the responsibility of one town or a section of a big city. To manage the resources in the rural areas the CGF was selected. The Federation had several qualifications that ensured it could attend to the peasant communities’ needs:

- Experience in the mitigation of natural disasters (Jorge Cardenas as published in *Actualidad Cafetera*, No.52)
- Support and credibility from the community
- Infrastructure spread throughout the rural areas
- Administrative , financial and organisational infrastructure
- Experience and knowledge of the physical and human context
- Availability of resources to invest in the reconstruction
- Independent decision making
- National and international commercial and political contacts
- Well-established community organisations at different scales. (i.e.: national, departmental and municipal committees)

After being selected as an institution with an explicit mandate, the next and most important step was the creation of a parallel fund to be managed by the CGF. This fund was created to assist coffee workers’ and non-coffee workers’ farms, and also small towns of up to 2,500 habitants.

The new fund was called FORECAFE, (Fondo para la Reconstruccion del area rural Cafetera). It was created with 30,000 million pesos from savings of the CGF (Fondo Nacional del Café), and 85,000 million pesos transferred from the FOREC. From the

total resources, equivalent to CAN \$ 86,3 million a first program was created called FORECAFE 1.

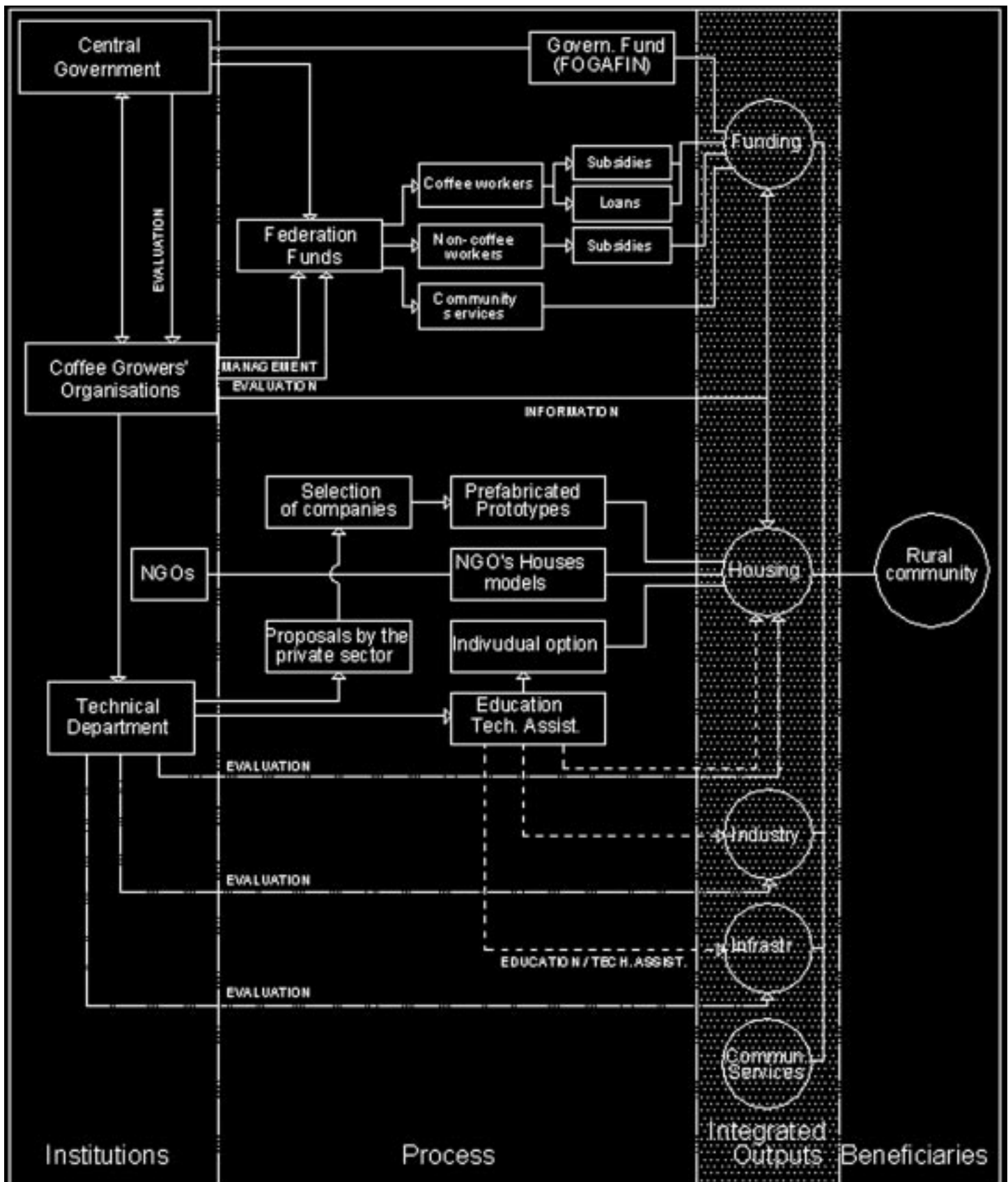
FORECAFE 1 was designated to provide money to affected coffee growers and coffee workers. Considering the efficiency and advantages of this program, the central government asked the CGF to manage a second one, FORECAFE 2. It was the program to provide subsidies and loans to non-coffee workers' families or inhabitants of rural small towns. One year later and after the evaluation of the positive results of the former projects, the central government asked once again the CGF to manage a third program, FORECAFE 3. This last program was designated for community services.

FORECAFE 1 met the following areas: housing, productive structures for the coffee industry, public services infrastructure, and programs of assistance and social development. FORECAFE 2 was designated for housing reconstruction and relocation. FORECAFE 3 was designated for the construction of schools, roads, health care centres, police buildings, churches and social activity centres.

#### **4.3.3. Outputs**

Organisational chart 5 illustrates the analysis of the reconstruction program through the 5 basic products or outputs that were offered to the community: (i) funding; (ii) housing, which could be promoted by the CGF, others NGOs or individual option; (iii) industry structures; (iv) infrastructure (public services); and (v) community services. In addition, two complementary activities accompanied the previous basic outputs:





Organisation Chart 5

# RECONSTRUCTION PROGRAM

information and technical assistance (which includes education). For the purposes of the analysis, the outputs and activities have been classified. However, they cannot be considered to be isolated or independent of the whole. It is precisely the joint articulation of the different outputs and activities, which enabled them to meet the specific requirements of the rural population.

#### **4.3.3.1. Funding**

According to UNDRO, “One of the most important components of a post-disaster shelter program is its financing system. Outright cash grants are effective in the short-term only, and can create a dependency relationship between survivor and assisting groups. It is far more advantageous for both the individual and the community to participate in the financing of their own shelter programs, especially permanent reconstruction” (Shelter after disaster. p. 3).

Instead of providing finished houses and infrastructures, the CGF opted for a strategy where individuals received financial aid and made the decisions about the built environment to live in. Despite the vulnerabilities of the rural population, (as explained in chapter three), this strategy was implemented due to the following strengths of the community:

- As the community’s economy is based on individual agricultural activities, most of the families own the land where they live.
- Farmers could develop self-help construction, due to the following aspects:
  - Farmers have skills and knowledge on construction.
  - Their extended families allow many people to work on each dwelling
  - The regular season of harvest recollection was almost 5 months after the disaster, leaving peasants time for other activities.
  - Farmers work individually and run their own businesses, which allows them independence to manage their time.
- Construction materials are usually available in small towns in rural areas.

- If some families could not or did not want to adopt a self-help construction approach, a labour force is still affordable to hire, even for small individual projects.
- Rural communities have a deep-rooted sense of co-operation.

To get access to money, the community could apply to two different sources: the loans from the Central Government, called FOGAFIN, or the money from the funds managed by the CGF. The Federation gave money to coffee workers and non-coffee workers in the five Departments affected.

#### **4.3.3.1.1. For coffee workers. Program FORECAFE 1**

For administrative purposes, the coffee growing farms were classified in two groups. Farms with an area less than 10 hectares (Category “A”), and farms bigger than 10 hectares (Category “B”). For both categories, two products were offered to each family: (i) funding for the family house and (ii) funding for infrastructure, productive structures or other constructions. For the family house two possibilities were offered: a subsidy of maximum 8'000,000 pesos (CAN\$ 6,000) for reconstruction within that budget or the same subsidy plus a loan of maximum 2'000,000 pesos (CAN\$ 1500) for reconstruction up to 10'000,000 pesos.

For infrastructure, productive structures, or other constructions, two possibilities were offered: a subsidy of maximum 4'000,000 pesos (CAN\$ 3,000) for reconstruction within that budget or the same subsidy plus a loan of maximum 6'000,000 pesos (CAN\$ 4,615) for reconstruction up to 10'000,000 pesos.

#### **4.3.3.1.2. For non-coffee workers. Program FORECAFE 2**

In this category, the CGF offered one product to each family, funding for the family house. A subsidy of maximum 8'000,000 pesos (CAN\$ 6,000) for reconstruction within that budget was assigned to non-coffee families.

For relocation, infrastructure, productive structures, or other constructions the community could apply also to the central government fund (FOGAFIN)

In all the cases of the programs FORECAFE 1 and 2, subsidies and loans were given under promissory notes with a time limit requirement. This meant that if the construction was not finished in the specified time, and following the hazard-resistant specifications, money had to be paid back immediately to the fund. This was an attempt to guarantee that the use of the resources fit the priorities of the program, namely housing and infrastructure.

#### **4.3.3.2. Housing**

As each NGO in charge of a zone developed a different program of reconstruction, many housing products and programs were offered to the victims. The reconstruction program of the Coffee Growers' Organisations allowed people to repair or build houses with any of the different choices available in the market. Therefore, affected families could receive financial aid, infrastructure, technical support for their industry, information, and technical assistance promoted by the program with any of the three possible options: (i) prefabricated houses promoted by the CGF, (ii) houses from others NGOs' programs, or (iii) individual option. For the construction, people could choose between building themselves or hiring labour. Whatever the option used, the house had to be earthquake resistant to be eligible to the money of the funds. Twenty-

three specialised engineers were selected to approve the hazard-resistant quality of the units.

#### **4.3.3.2.1. Prefabricated houses promoted by the CGF**

The aim of the Federation's housing program was that each person in the community would take responsibility of the reconstruction of the house, and each person would be free to select the type of house to be constructed. Therefore, the reconstruction was complemented by a housing promotion program that is analysed through three stages: (i) design, (ii) selection of constructors and (iii) exhibition.

##### **4.3.3.2.1.1. Design**

Important lessons can be gained from the analysis of the units proposed by the CGF. Targeted to rural families, three different prototypes of one-storey houses were designed. The first prototype with a semi-open space in the corner, the second one with an extended verandah in the front façade, and a third one with a cross ventilation opening in the centre. One of the prototypes has been illustrated in detail showing the plans, the models built, the price (in pesos and Canadian dollars), the specifications, and finally a comparison of the prototype with traditional dwellings of similar typology.

The models were designed to be built in extended versions or to grow in time as the family enlarges or as more resources become available. This aspect presumably responded to the constant transformations of the traditional architecture in the region where 70 percent of the vernacular units have later interventions (Fonseca, *La Arquitectura de...* p.170). The result was a set of compact houses that can be easy

related to typical traditional units in the area (See traditional typology comparisons charts). The houses included two bedrooms, a kitchen, one bathroom and a social area. The general layouts and proportions of the units correspond to traditional dwellings, and typical characteristics of the vernacular architecture in the region were included in the design. The units had a one-storey plan (79 % of the vernacular houses are of the one-storey type), with the social area in the semi-open space, railings for the semi-open space, direct communication to the backyard, an exterior sink on the back façade, and an interior storage room.

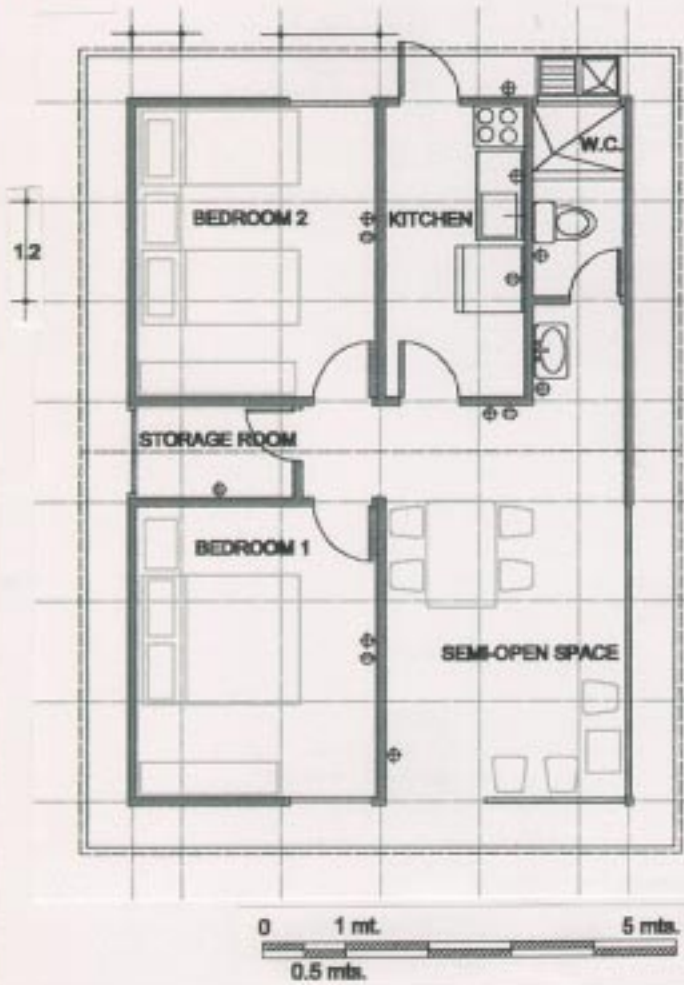
According to Fonseca, 42 % of traditional houses in the region have a four-slope roof, and 42 % a two-slope roof (p. 171). In this aspect, once again the design seemed to respond not only to an efficient use of materials. It also involved a culturally appropriate response to vernacular architecture, as simple two and four-slope roofs were adopted.

The units were designed over a grid of 1.20 by 1.20 m. in order for them to be able to be produced with prefabricated modular systems. Also the bathroom and the kitchen were placed back to back to optimise services installations. Openings in the facades were distributed and proportioned to minimise waste of material in frames and panels. In the bedrooms, the windows were placed at the opposite side of the entrance door. This not only facilitates cross ventilation in the room but also brings a better visual impression when entering the space, making it look bigger. A simple and efficient electrical installation was included (see plan).

**Plan**

0.6

1.2



Company: Construccion Jasagh



Company: Giraldo Calle y Cia.



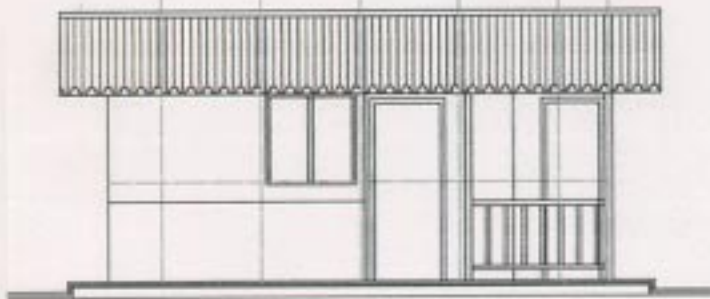
Company: Const. Futuro XXI



Company: Manilit



**Elevation**



**Prototype 1**

By allowing cross ventilation and including covered semi-open areas and extended roof cantilevers (called 'aleros' in Colombia), the design of the prototypes responded to the hot temperatures and heavy rains of the region.

In the Colombian housing market, prefabrication (in Spanish 'prefabricacion') describes a system of on-site construction using industrialised modular components (i.e. panels, ceilings, steel structures, tiles, windows, and door-frames). Different factors can be related to the selection of pre-fab technologies:

- a. Speed of construction, compared with traditional 'bahareque' or masonry technologies.
- b. Big pre-fab companies offer infrastructure, financial, technical and administrative support that small building contractors do not provide.
- c. The fast diffusion and relatively good acceptance of the new pre-fab systems in the construction market.
- d. Pre-fab companies provide earthquake-resistant standards, technical controls and guaranties that small contractors cannot.
- e. Components and structures are lighter compared with traditional 'bahareque' or masonry constructions. This facilitates construction and decreases the cost of foundations.
- f. Pre-fab companies offered competitive prices during the economic recession, as a consequence of the inactivity of the construction sector.
- g. The government offered tax benefits to companies working in the affected area.

The most relevant tax policies related to housing are:



- Special tax savings for pre-fab companies that commercialised in the area, which allowed them to make contracts free of registration tax (impuesto de timbre).
- Tax savings for employers in the area, which allowed them to avoid paying social tax (SENA).
- Tax savings for the creation of employment. (100% of the money invested in salaries)
- Tax savings for renting construction equipment (100% of the money invested in that issue)
- Tax savings for income tax (impuesto de renta) (100% free). For individuals.
- Tax savings for profits tax (utilidades) (50%). For companies. (source: Ley Quimbaya” *Newspaper La Tarde* July 26, 1999. P. 12 A).

All these factors made pre-fab a reasonable option to be promoted by the CGF.

Furthermore, these tax policies associated with the economic recession in the rest of the country, attracted the participation of pre-fab companies and permitted them to lower their regular costs.

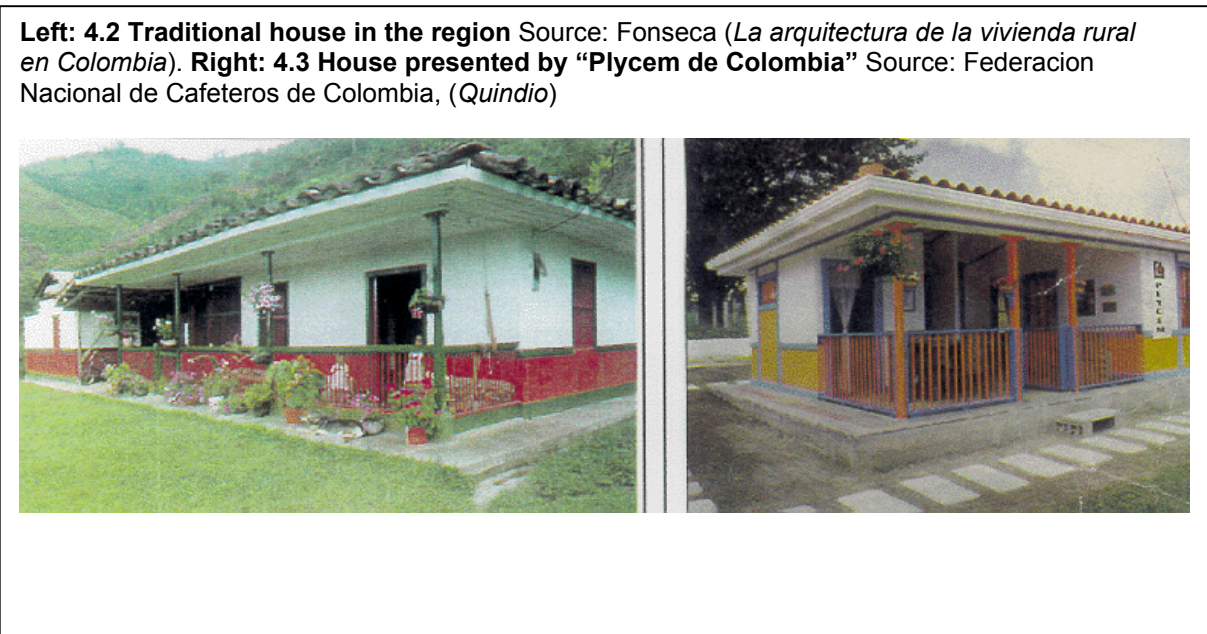
#### **4.3.3.2.1.2. Selection of builders**

The CGF opened a call for proposals to select the companies to be present in a housing exhibition. From more than 50 proposals, 17 companies were selected. The original designs and specifications proposed by the CGF gave general conditions and requirements to make possible the evaluation of proposals. However the final products for the exhibition were slightly modified by some participants. Most of the selected companies used pre-fab modular systems. However, few used mixed systems including modular steel structures with masonry divisions (Losas Ltda.) or “bahareque” (Metalmecano). Three more used modular systems with timber or “guadua”.

The companies were selected according to the following criteria: (i) quality of the system, (ii) price, (iii) production capacities, (iv) socio-cultural acceptance of the technology, and (v) use of local labour force.

Each company used different finishes and some used traditional colours and elements to match their proposals to the typical architecture of the region. This aspect gave multiple choices to the clients, allowing them to select the most appropriate option.

The following pictures show one of the pre-fab proposals compared with a traditional house in the region.



#### 4.3.3.2.1.3. Exhibition

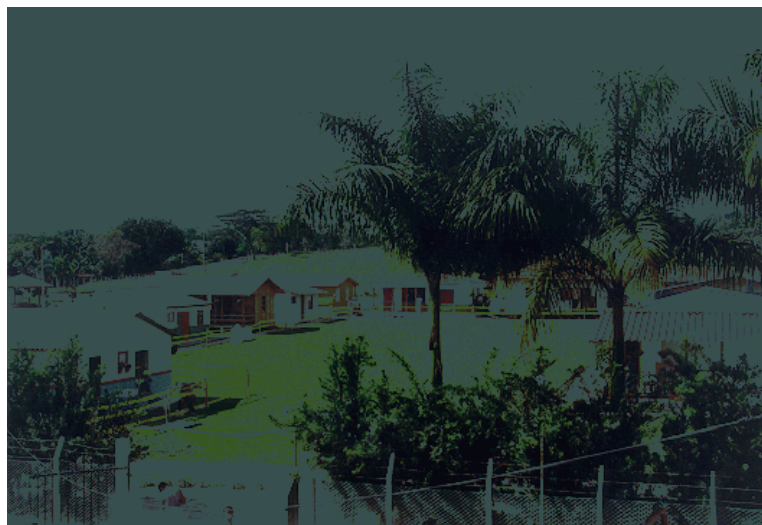
In order to increase the possibilities of choice for the community, the selected companies were allowed to present a model of the house in the grounds of a country club. The objective of the exhibition was to promote the already evaluated and approved solutions in the community. However, according to Edgar Echeverri, Director of the department of production and development in the Federation, in many

cases the exhibition was a source of inspiration for many affected residents who copied the models to build them by themselves. (Cafered, p. 8)

For the Coffee Growers' Organisations, this was the perfect scenario to obtain, through competition between companies, the best products and show them through full size demonstration houses. At the same time, the exhibition permitted the CGF to present to the community some physical proof of the work being undertaken on their behalf and showed their concern for the reconstruction process. For the companies it was a good opportunity to explain their projects, market their solutions, and attract clients. For the community residents it was an educational exercise, an opportunity to buy quality products and an opportunity to feel that they had the responsibility for, and the liberty to complete their own reconstruction. Finally, from the perspective of architectural design, the exhibition is a worthy example of culturally appropriate housing designs coexisting with appropriate technological solutions from which many lessons can be gained for future housing projects.

**4.4 View of the housing exhibition promoted by the CGF.**

Source: Federacion Nacional de Cafeteros.



#### **4.3.3.2.2. NGOs' houses**

As explained before, the reconstruction program gave absolute independence and responsibility to the rural community for its own housing options. Therefore, people had the opportunity to copy any of the solutions promoted by other NGOs which best suited their requirements. The survivors then had a variety of options to adopt or imitate, and they could learn from different layouts and technologies. These technologies ranged from houses in guadua, (as was the program headed by the “Camara de Comercio de Manizales” in Pijao), or traditional masonry and reinforced concrete structures (as was the program led by Fenavip in Montenegro), to the mixed technology housing program used in the town of Barcelona for single parent families. This was a unique opportunity for the community to learn from several responses provided by each institution. The aim of the CGF was to guarantee the satisfaction of every individual and avoid the monotony and restrictions of a single solution.

#### **4.3.3.2.3. Individual option**

Concerning the development of individual options and self-help construction, the CGF supported the rural community with education and technical assistance. (see.4.3.3.5). As an example, it is important to highlight the program developed by the Federation in joint venture with the German Government for the development of 300 self-help houses with an investment of more than CAN \$ 1 million. In this program, that used traditional “guadua” technology, the institutions provided the resources and the community provided the labour force. (Cafered, p. 13)

#### **4.3.3.3. Industry structures, Infrastructure and community services.**

The CGF and Coffee Growers' Committees provided loans, subsidies, education, and technical assistance for the development of the structures required for coffee production such as "beneficiaderos" and silos. To lower the impact on the environment, the CGF established ecological rules and requirements for access to financial support. In one year, 3,844 environment-compliant "beneficiaderos" were built or reconstructed. (Cafered, p. 7)

Special loans and training programs provided by the Coffee Growers' Organisations also supported the construction of infrastructure. Water tanks, septic infrastructures, water supply, electricity and telephone connections were supported in this way to complement the house construction.

With FORECAFE 3, 270 schools, 60 water supply systems, churches, and health, police and community centres will be built during the year 2000. (Cafered, p. 3)

#### **4.3.3.4. Information**

As a complementary activity, the coffee worker's organisations provided information to the community about the following aspects:

- Advice, such as:
  - Technical advice on how to build septic tanks or floor slabs
  - Hazard-resistant principles
  - How to select the appropriate house
  - How to maintain the traditional identity of the houses after the disaster
  - How to deal with psychologically affected survivors

- General encouragement
- Evaluation of damage (including a housing census)
- Projects in progress
- Requirements to access the available financial resources
- Promotion of the various products (housing, tents, food, etc.)
- Results and preliminary evaluations of the programs

Some information was provided in newspapers and magazines published by the coffee worker's organisations. Some of these are: "Cafered", "Quindio", "Actualidad Cafetera" (Quindio's committee), "Panorama Cafetero", and "El Caficultor". Other sources of information were local newspapers such as "Café 7 dias" and "La Tarde".

Rural communities in Colombia usually receive little assistance from the central authorities and there is a lack of education and organisational support. The constant contact of the coffee worker's organisations with the rural community attempted to gain support and credibility for the programs, and to mitigate the psychological effects of the disaster.



#### **4.3.3.5. Education and technical assistance**

To reinforce the self-help programs, the CGF published an educational guide for the construction of earthquake resistant one and two-storey houses. The guide, illustrated with multiple colour drawings and schemes, provided not only technical instructions but also general knowledge in a basic language appropriate for communities with little

education. The guide described processes and recommendations for concrete and masonry construction.

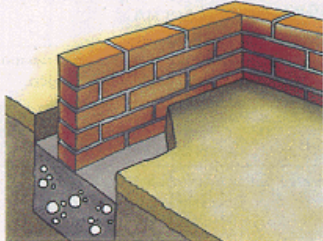
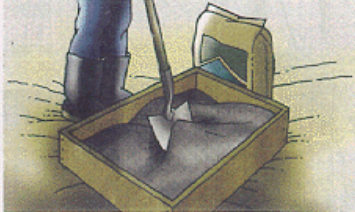
**4.5 Construction guide. Source:** Federacion Nacional de Cafeteros de Colombia. *“De los corazones sismo resistentes del Quindío para Colombia: Guia practica de construcciones sismo resistentes para viviendas de uno y dos pisos.”* Quindío: 1999

**El concreto**  
También llamado hormigón. Es la mezcla de cemento, agregados y agua. Sirve para hacer estructuras sismo resistentes.

**Concreto Simple**  
Mezcla de cemento, arena, grava y agua. Tiene diferentes usos según su consistencia como placas de piso, patios y andenes.

**Concreto Reforzado**  
Mezcla de concreto simple y acero de refuerzo (varillas de hierro). Se utiliza en vigas, columnas, dinteles, fundiciones y losas.

**Concreto Ciclópeo**  
Mezcla de concreto simple al 70% con piedras de mano al 30%. Se utiliza para muros y cimientos.

**Mortero**  
Mezcla de cemento, arena y agua. Se utiliza para unir los bloques o ladrillos, para revoques o para rellenos.

**Elementos**

- Cemento fresco y de buena calidad.
- Agregados bien lavados.
- Agua limpia.
- Balde o cajón para las medidas.
- Mezcladora o concretadora.

As a complement to the program developed with the German Government, another guide was provided to the community. The guide described processes and recommendations for construction of one-storey houses in traditional technologies, using “guadua” as the main structural material. Also in this case, colourful easy-to-read graphics were used to reach most of the population. The actual construction was supervised by a selected group of specialists in order to guarantee the hazard-resistance of the structures and finishes.

In the next chapter, the evaluation of the reconstruction program continues the analysis of the co-ordination between the ‘physical’ and ‘soft’ factors of reconstruction.

## Chapter five - Evaluation of the case study

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Following the case study methodology, the evaluation, that includes interviews with the groups involved in the reconstruction process, is presented in this chapter. The 'physical' and 'soft' factors of the social reconstruction prove their significance in the success of the program.

### 5.1. Introduction

The evaluation is presented in two sections: the results obtained by the program, and a qualitative assessment. In the first section, quantitative results illustrate the effects of the program in four aspects: funding, housing reconstruction, creation of employment opportunities, and economic recovery. The second section includes official reports from the institutions involved, such as the World Bank, United Nations' World Food Program, United States Office for Disaster Assistance, the Colombian Presidency, and the Coffee Growers' Organisations. Interviews with members of the community support the evaluation, illustrating the levels of satisfaction and particular comments by some individuals.

Testimonies from the community are drawn from the results of a survey. The questionnaire seeks to clarify the relative importance of the 'soft' and 'physical' factors of the reconstruction in the acceptance of the program, the participation of the community, the fulfilment of people's needs and expectations, and finally, as a result of the above, the effectiveness of the housing agenda.



## 5.2. Results obtained by the program.

- **Funding:** After the latest negotiations between the Government and the CGF, the programs FORECAFE 1, 2 and 3 represented an agenda of **\$115,000 million pesos** (CAN\$ 86,3 million), a high budget but necessary to meet the ambitious program. From that budget, after one year (January 14, 2000) 85 % of the funds devoted to FORECAFE 1 were already given to victims and 15 % were in the process of being assigned for minor housing repairs. Also, by January 2000, 70% of the financial resources of FORECAFE 2 were assigned, and the program FORECAFE 3 was beginning. With these results, an average of CAN\$123,000 entered the construction market daily. This is an impressive investment in rural areas that were previously affected by a dramatic economic recession and high unemployment.

(Source: Cafered, January 25, 2000)

- **Housing reconstruction:** During the first 10 months of the reconstruction process, 14,138 building projects were finished, having just 3,164 yet to be completed. Completing an average of 50 finished projects daily, 8,163 houses were built, 3,844 projects related to the coffee industry were developed, and 2,131 other projects related to infrastructure and other needs were finished. (Source: Cafered, January 25, 2000)

- **Prefabricated houses built:** Despite the fact that the number of completed pre-fab houses has not been officially reported, the CGF has unofficially declared that very few houses were sold. One of the most important pre-fab companies involved in the program reported unofficially that just six units were sold. In the fieldwork visit, out of almost 50 farms observed, just two included a pre-fab house.

- **Employment opportunities created:** According to the CGF, nearly 10,000 jobs were created during the reconstruction process. At the same time, self-help construction became a self-employment activity for householders in-between the harvesting collection. (Source: Cafered, January 25, 2000)
- **Economic recovery:** Despite the recovery of the coffee growing infrastructure and the efficient introduction of resources in the area by the CGF, several external aspects limited the economic recovery of the area until the year 2000. Some of those aspects are:
  - The unfavourable weather conditions that affected the coffee harvests
  - The relatively slower reconstruction process in the main urban centres
  - The general economic recession in the country
  - The general and increasing unemployment in the country (close to 24.1% in Pereira)
  - The change of the Colombian financing housing policy that has stopped the offer of loans by the financial sector
  - The general reduction of exports
 (Source: Café 7 Dias, January 21, 2000).

### **5.3. Qualitative evaluation**

**The World Bank:** From the National Government's disaster relief budget, 46% came from loans given by the WB. According to Alberto Chueca, who represents the WB in Colombia, the institutional model adopted is innovative, since public entities are not the ones in charge of the reconstruction, but rather particular NGOs. This de-centralised model brings more participation on the part of the citizens. In the first

anniversary of the disaster, Chueca explained that this program is from the type of models that the WB has recommended in the last few years. In his visit to Armenia he expressed that “the results show an investment that is bigger than the usual devoted to these situations... this [investment] has permitted the creation of jobs, the use of new technologies in the city [Armenia], and the expansion of the regional economy and regional planning”. (Source: El Espectador, January 25, 2000)

**United Nations’ World Food Program**: According to the Coffee Grower’s Committee, a WFP’s delegation visited the rural area affected by the earthquake and verified the “opportune distribution of the food rations to the coffee growers’ families affected.” (Source: Actualidad Cafetera, Jan-Feb 1999, p. 10)

**United States Office for Disaster Assistance (OFDA)**: An evaluation of the adequate use of the materials given by OFDA for the construction of temporary shelters (see 4.2), was conducted by the international agency. Juan Pablo Sarmiento, representing the agency, expressed that the CGF and Committees “played an important role when guaranteeing the appropriate collection, storing and distribution of the materials given by OFDA” (Source: Actualidad Cafetera, Jan-Feb 1999, p. 6)

**The Colombian Presidency**: In the first anniversary of the disaster, Andres Pastrana, President of Colombia, expressed his satisfaction with the performance of the reconstruction program in general. Furthermore, the President highlighted the program developed by the Coffee Growers’ Organisations and signed a document recognising the achievements in rural reconstruction.

**The Coffee Growers' Federation:** The satisfaction of the Coffee Growers'

Organisations has been reported in several publications and the President of the institution, Jorge Cardenas has praised the results in periodicals and internal bulletins. However, to highlight important lessons of the internal aspects of program, extracts from the personal interview conducted with Jose Fernando Botero, engineer of the program FORECAFE, are translated and presented in this section. (Armenia, June 18 2000)

When asked about the “key of success” in the program, Botero expressed that the following aspects guaranteed the success of the rural reconstruction:

1. The human aspect: “As we have been working with the rural community for many years, we didn’t need to get acquainted with our client; we knew who we were working for, their needs, their particular culture, how many and where they are and even their names, age and their occupations”
2. The administrative model: “The model is not good, it’s perfect! We abolished bureaucracy, long proceedings and useless paperwork. How did we do that?
  - We abolished the myth of the budget, we abolished the extended, detailed, and useless budgets that we [in Colombia] are use to. We switched over to budgets of only six or seven items. How much does a structure, the walls or a roof cost? That’s the real information we need. We also abolished the myth that it is impossible to build a decent and worthy house with a minimum budget.
  - Information: Forget about extended evaluations. A one-page questionnaire and one picture, that’s all we needed to evaluate damages. We didn’t even use computers and printers, a pencil and a well-structured questionnaire was all we

needed. We have in our files free-hand designs of houses improvised by the residents. Those amateur sketches were technically correct and we approved them. Forget about blueprints and refined drawings, we have here a rural population that can be creative and produce results.

- Funding: We didn't see the money. We had a financial entity in charge of that. We could concentrate in the technical aspects and the financial entity was in charge of the payments with a very simple process for the user.
- Inspection group. The inspection group of professionals constituted a social team, an entity that demanded the respect of necessary technical aspects but had human and social contact with the community”.

3. Responsibility. “Rural residents knew that only they were responsible for their own house. They assumed it and they did it, instead of us taking the responsibility of providing the houses. This model guaranteed the total satisfaction of the user because they built what they needed and what they wanted. We created the platform but they are the ones who should be praised for this process. The rural resident, unlike the city inhabitant, lives in a hostile milieu; he knows how to confront these kinds of situations. We had confidence in these people and we supported them.”

4. Land ownership: “the rural resident has land and that had a great influence on the kind of program that we could use. We didn't have to devise a relocation program”.

5. Experience: “The Coffee Growers' Organisations have many years of logistical experience. Besides, we had experience because we had participated in other disaster programs”.

6. Service: “This is a guild and the users and employees are indirect owners of this enterprise. Everybody has to have a vocation to work here. Our proceedings are clear and honest and everyone perceives that image”.

7. Support: “We did more than build houses. The Coffee Growers’ Organisations have gained the people’s confidence after working on different projects such as in the coffee industry’s infrastructures, roads construction and sanitary infrastructure among others.”

When asked about the parallel prefabricated housing program, Botero explained that it was a great scenario for the peasants to buy parts (i.e. windows, doors, modular roof tiles, etc.) and an interesting educational milieu. However, Botero added that “those notions of ‘going to buy a house’ or buying a house by catalogue do not exist in the rural community”. The dwellings are built in a long-term process and are extended and improved as the resources improve or as the family’s requirements change.

Concerning the prefabricated houses sold, the evaluation from the pre-fab companies has been extremely discrete, and even the Coffee Growers’ Organisations have little information about the companies’ conclusions. It is easy to assume that due to marketing strategies, no official results were available. However, each of the companies had to cover several expenses in order to participate in the pre-fab program: participate in the bid, design the model, build the model in the exhibition, move sales and technician personnel to the rural area, and finally market the product. It is important to clarify though, that the companies that participated can be classified in two groups: the big and the small ones. From the group of seventeen, five

companies can be considered in the first group (i.e. Colombit S.A, Servivienda, Corpacero, Plycem, and Ladrillera Santa Fe). These five are old and well established companies in the construction market. Being part of relatively strong economic groups, they have several branches nation-wide, they produce several construction components and they are able to offer multiple products and alternatives. Considering the unofficial results, it is also easy to presume that the cost-benefit balance affected strongly the small companies that had less products to offer, and presumably, less infrastructure and financial support.

### **Rural Testimonies**

The evaluation of community members are represented by extracts translated from a series of interviews from which nine different representative cases have been highlighted.

**Case 1** (located in the municipality of Circacia) This large-scale coffee production farm is run by a thirty years-old proprietor who lives in a mid-size house in the production area. Satisfied with the efficiency of the reconstruction program and hiring labour force, he not only repaired the damaged house but also rebuilt the industrial infrastructure. The resident added his own resources to “use the opportunity to make a few improvements”. Enthusiastically explained by the young man, those improvements included better finishes in the house, a new production-related project, a service extension in the house, and also a roofed terrace.

**Case 2** (located in the municipality of Circacia) This small-scale coffee growing farm is owned and run by an elderly couple who live in a small-size house centrally located on

the land. Initially the residents improvised a weather protection; then, they hired labour force for the construction that lasted almost three months. They received information, technical assistance and advising from the CGF's program. The satisfied couple improved interior finishes, the roof structure, and ceiling finishes, and also built a new septic tank and water supply infrastructure.

**Case 3** (located in the municipality of Circacia) This is a large-scale production farm which reconstruction project included repairs in a large house and a couple of small buildings related to the coffee industry. The farmer's administrator and his family inhabit the house, which required several repairs and a new sewer system and electrical service. A large warehouse and production-related infrastructure were rebuilt and improved in an efficient six-month process.

**Case 4** (located in the municipality of Circacia) Includes a totally destroyed traditional dwelling, where residents were forced to improvise a temporary shelter and finally build a new small masonry house that would include new water supply, sanitation and electrical services. Not eligible for the CGF's program, the family received support from the Colombian and German red cross.

**Case 5** (Located in the region "La Aldea") The destruction of a chalet-like dwelling forced the residents to build a pre-fabricated house as promoted by the CGF. Even though the affected family does not own the land where they live, they supervise the farm and the coffee industry for the owners. The destroyed and the new house, separated for approximately fifteen meters, are located in the owners' recreational weekend farm. Despite it being considerably smaller, the satisfied residents consider the new house to be better than the one they inhabited before. According to them, "the new prefabricated house is very well designed and we have in less area the same



things we had in the other house. Besides, now we have new and better sewage, water and electricity systems”

**Case 6** (Located in the municipality of Montenegro) This production farm included a damaged mid-size traditional dwelling. This dwelling is inhabited by the owner’s family who also runs the production business. The residents, pleased with the program, not only stabilised the house with a reinforced concrete structure but also improved some finishes. They even extended the veranda and added another room to the house.

**Case 7** In this large-scale production farm, a large weekend recreational house and a small dwelling occupied by the farm-administrator’s family were partially affected. Initially supported by the program, several repairs were done to the small residence. However, the large house was not only repaired, but also a luxurious roofed terrace was added. Residents explain that “the period of reconstruction was used to improve both houses.”

**Case 8** This project, which is still in the process of an ambitious reconstruction, is a large-scale farm where five different buildings were affected. Despite the positive use of the resources from the program in the other constructions, a new house for the administrator’s family is still required.

**Case 9** This mid-size traditional dwelling, inhabited by the administrator’s family, received non-structural damages. Various renovations have been completed including extending the services area and adding a storage room in the backyard. Built in masonry, the repairs and new constructions were proudly presented by the residents who expressed their gratitude to the CGF’s program. Several members of the family contributed with the construction, and hiring labour force was not necessary.

## Chapter six - Conclusions

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Grouped in two levels, the findings are discussed in this section. First, the conclusions are drawn directly from the case study, and finally, following Yin's methodology, the "analytical generalisations" obtained from the research are presented.

### 6.1. Case study's findings

The success of the CGF's housing program relies on the appropriate co-ordination between the technical aspects of the reconstruction (physical factors) with the strong involvement of human, social and cultural aspects (soft factors). With this strategy, rural reconstruction has not only mitigated the effects of the disaster, but it has also improved the quality of life of numerous families, reducing residents' vulnerability to future natural hazards and yielding accepted and desirable construction forms and technologies.

The parallel pre-fabricated housing program demonstrated that the use of foreign construction methods is unnecessary in the region, and it is also vaguely accepted as a substitute of traditional forms of construction. However, despite few houses were actually sold, this program has also proven that the community is willing to learn and incorporate efficient layouts and modular construction parts. Yet the notion of buying finished houses as final products is not widely accepted in the community, and therefore the program would not have been equally successful if it had relied only on prefabricated models, the pre-fab technology can not be excluded as an alternative in

two different levels. First, well-conceived pre-fab houses, as presented in the exhibition, are an affordable alternative for families that can not or do not want to opt for self-help construction or that are not willing to hire constructors to work with traditional technologies (i.e. bahareque, guadua, masonry). Second, the acceptance of modular construction parts in the rural areas of the region could represent a potential market for pre-fab companies.

The institutional model that was adopted, proved to be efficient and was unanimously accepted, this opening the possibility of its use in future programs.

## **6.2. Analytical generalisations**

Disasters, usually studied as devastating phenomena, can also be seen as extreme conditions from which many lessons can be gained for architects. Architects must understand the importance of residential construction in determining the communities' vulnerability to disasters. They must also understand that a disaster is a complex result of strengths and weaknesses in three different layers: the environment, people and institutions. As the chances of repetitive natural hazards are high, the architect's responsibility for residential reconstruction is not only the reduction of physical vulnerabilities. Also his participation is crucial in the constitution of sustainable social, environmental and institutional strengths that reduce the effects of hazards. Therefore the technical design (the traditional part of an architect's work) has now to be accompanied by organisational design.

Of great importance to the future quality of life of survivors, residential reconstruction must be sensitive to the weaknesses and strengths of the community. Only through the proper interpretation of these weaknesses and strengths can low-cost housing programs reach acceptance and efficiency in the community. Affected communities with traditional cultural roots are usually sceptical to external projects of intervention. Therefore the reconstruction approach for traditional poor communities must not only meet technical and physical needs but also must involve a supportive platform capable of gaining the respect and confidence of the residents.

While being sensitive to the traditional typologies and indigenous technologies, the residential reconstruction in rural communities should not underestimate the capabilities of survivors to rebuild themselves. Providing opportunities for participation in decision making in a program that provides technological, psychological, cultural, social and financial support, a community may be able to develop an efficient construction process with a more satisfactory final product.

As many authors argue, several social negative consequences and undesirable effects in the built environment can be the result of delaying the permanent reconstruction process by allowing programs of temporary shelter. However, it is important to consider that if weather conditions threaten the lives of the survivors, temporary shelters become almost indispensable, and should allow the protection of survivors during the reconstruction of permanent housing. On the other hand, if weather conditions are not extreme, the permanent reconstruction programs must immediately follow the attendance of the primary emergency needs in the

rehabilitation period. Perishable shelter solutions may accompany low-cost housing construction. However, in order to gain the fastest economic and social reconstruction, permanent residential programs must be implemented as soon as possible after the disaster.

Different in their very nature, urban and rural low-cost housing reconstruction projects should be considered in their own distinct ways. Unless the speed of construction is a priority due to extreme weather conditions, the use of foreign housing prototypes and imported solutions in traditional rural communities may not only prevent rapid local economic recovery, but may also lead to unsatisfied residents.

Although disasters are devastating scenarios of death and destruction, appropriate post-disaster reconstruction does provide the opportunity to improve physical and social aspects in the private and public realms. The continuity of cultural traditions and values should be always respected in the social, institutional, and architectural realms. The correction of previous deficiencies and weaknesses can be addressed after the disaster, making reconstruction an opportunity for improvement and development. Without imposing imported notions of development, the post-disaster low-cost housing programs must be sensitive to the community's needs, providing the opportunity for the survivors to achieve better quality of life.

Low-cost residential reconstruction may be strongly related to the opportunities for economic recovery in the community. In fact, combined with the creation of local employment opportunities and with the regional construction market, housing

programs may enhance the psychological and material well-being of the survivors. Furthermore, rebuilding projects related to production and the local economy is crucial for the social reconstruction of the community.

Taking advantage of the survivors' awareness of the effects of disasters, the reconstruction stage provides an opportunity for the implementation of educational and technical assistance programs that could mitigate the effect of future natural hazards. This is also an opportunity to correct previous technological or structural deficiencies common to residential construction, and to educate the community about the importance of maintenance and the correct reinforcement of structures.

The following is the complete testimony of Oscar Bermudez, whose quote was partially transcribed in the first chapter.

*“In the earthquake I was with my wife, Rubiela, in the town, and we were surprised to see the houses falling down....we almost had to walk to my farm as there was no transportation. When we arrived, I felt happy to know that my family was alive, but at the same time very sad to see the house totally destroyed... We thought we could not rebuild our house again because we didn't have any resources...” “Thanks to God and the Coffee Growers' Committee we found the way to rebuild. With my brother who helped me, we provided the labour force, we worked really hard but it was worth it. It was a four months process and now we have a better house than the one we had before...”*

Oscar Bermudez. Peasant citizen of Calarca, Colombia; when asked about his experience in the earthquake. (Translated from Cafered, January 25 2000. p.15)

**By the time this report was being printed, the Colombian Presidency and CGF were still discussing the possibility of developing a new and even more ambitious housing program. Though not for reconstruction purposes, the new project, suggested by the CGF's president, would apply the experience gained in the 1999 reconstruction to develop a 15,000 rural low-cost houses program...**

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