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**EXPLORING ALTERNATIVE HOUSING POLICIES  
FOR URBAN ECUADOR:  
An Implementation of the  
Housing Quality Model**

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## INTRODUCTION

The Housing Quality Model (HQM) is a tool for exploring and evaluating alternative policies for improving housing conditions in developing countries. For any number of policy scenarios, the Model simulates changes in the housing circumstances of households at different income levels. More specifically, the Model estimates the number of households who shift from inadequate to adequate housing conditions as a result of alternative housing policies, and estimates the costs -- both in total resources and in public sector subsidies -- of achieving these improvements.

Implementing the HQM is not a one-time proposition. Instead, the Model can most productively be incorporated in an iterative process of information gathering, policy evaluation, and program monitoring. In this process, the Model not only forecasts future outcomes under alternative assumptions; it also helps pinpoint areas in which key information is lacking, and can provide an organizing framework for understanding how a country's housing sector functions.

This paper explains the data sources, assumptions, and procedures used to implement the HQM for Ecuador's two major urban areas -- Quito and Guayaquil. Its purpose is to serve as a status report, describing progress to date on an ongoing process. In the months ahead, the data sets and simulation results presented here should be refined and replaced as new information is gathered, new assumptions are agreed upon, and new policy alternatives are explored.

The remainder of the paper consists of four major sections. First, we describe key decisions about the scope of the Model implementation for Ecuador, as well as modifications to the Model's data requirements and logic that were needed to make implementation feasible here. The second section then documents the Model data sets we have constructed to date, providing extensive details about data sources, assumptions, and methods. Next, we present the results of five alternative policy scenarios, each of which is simulated for both Quito and Guayaquil under three possible economic environments. Finally, the report concludes with a summary of key areas for future analysis -- both with regard to information gathering and with regard to policy intervention.

## 1. IMPLEMENTING THE HOUSING QUALITY MODEL FOR ECUADOR

### Geographic Areas

The HQM can be implemented for any number of geographic areas or sectors within a country. The analyst must develop a complete data base for each sector or area to be analyzed, and outcomes are simulated independently by sector. The Model does not aggregate across sectors. In past implementations, the HQM -- like the Housing Needs Assessment Model (HNA) -- has been implemented for three sectors -- metro, other urban, and rural.

In Ecuador, however, it does not appear make to sense to combine Quito and Guayaquil into a single "metropolitan" sector, given the significant differences between the two cities. Therefore, the Model may ultimately be implemented for four sectors -- Quito, Guayaquil, other urban areas, and rural areas. The current implementation, however, will not implement the Model for other urban or rural areas. Instead, we are starting by implementing the HQM for Quito and for Guayaquil.

Since jurisdictional and statistical boundaries do not always correspond to the meaningful boundaries of an urban area, it is important to begin by defining what we mean by urban Quito and urban Guayaquil, and to determine whether the necessary data are available for these geographic areas.

The 1982 Census provides data for "urban Quito" and for "urban Guayaquil." We have learned from INEC that the "urban" portion of both cities is an area within the municipal boundaries that has a high density of buildings. The boundaries of these urban areas were drawn on the basis of aerial photos, and will be redrawn for the 1990 Census.<sup>1</sup> Both urban Quito and urban Guayaquil, as defined by the Census, appear to correspond reasonably well to a subjective definition of the two urban areas. While some informal settlements are excluded, most of these barrios probably did not exist in 1982. Therefore, we can rely upon the 1982 Census data to describe the characteristics of households in urban Quito and urban Guayaquil in 1982. The challenge is to estimate -- and ultimately verify -- the level and characteristics of population growth that have resulted in the expansion of urban Quito and urban Guayaquil since 1982.

### Simulation Periods

The HQM can simulate any number of years, and can present results at any intervals within the overall simulation period. In past applications, we have "calibrated" the Model by simulating an historical period, before using it to forecast outcomes for

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1. The office now has copies of the INEC maps for Quito and Guayaquil, on which the urban area boundaries are marked.

future years. Calibration simulations are used not only to test assumptions about housing market behavior, but also to update information about households and housing conditions.

For Quito and Guayaquil, we have decided to start with a 1984 data set that corresponds reasonably closely to the Housing Needs Assessment data assembled by Robert Nathan. This data set uses the 1982 Census distribution of households by type, tenure, and infrastructure, modified to reflect changes that occurred between 1982 and 1984. It also makes use of other data collected locally between 1982 and 1987 which supplements and corroborates the information we have obtained from the 1982 Census. The 1984 base input data refers to conditions at the end of 1984.

Using the 1984 base input data set, we have produced "calibration" simulations for the 1985-1987 period. These simulations serve both to test the plausibility of our assumptions, and to generate a starting point for simulations that look beyond the end of 1987. Note that the HQM operates in real currency units -- net of inflation. We have converted all sucre amounts to start-of-1988 terms.

Policy simulations will start with the 1987 data set generated by the calibration process, and forecast through 1992 under a variety of alternative policy scenarios. Because this is an exploratory, illustrative set of simulations, we do not recommend forecasting too far into the future. We selected a five year forecasting period for simplicity, and because the current World Bank program for BEV lending extends from 1988 to 1992.

We do not recommend presenting detailed year-by-year results of our policy simulations at this stage of Model implementation. Since much of the input data are based on assumptions and estimates rather than empirical observation, and since the policy scenarios reflect broad, illustrative alternatives rather than detailed programs, presenting year-by-year results would convey a false impression of precision. Instead, the current implementation of the HQM should be used to compare likely outcomes for 1992 under alternative scenarios.

### Income and Tenure Classes

The central organizational framework of the HQM is a matrix that classifies households according to their income, tenure, and dwelling and infrastructure adequacy. Past implementations of the Model have divided households into ten income categories (income deciles), and four tenure categories (fully documented owners, undocumented owners, unit renters, and room renters). Classifying household incomes by decile is clearly not feasible for Ecuador, given the very limited availability of income data. Therefore, we have simplified the Model slightly, to allow for only five income categories for the Quito and Guayaquil implementations.

The Model's standard tenure categories also do not appear to be appropriate, given data available for urban areas of Ecuador. Census data report five tenure categories -- 1) Propia; 2) Arrendada; 3) Gratuita; 4) Por Servicio; and 4) Otros. The category of propia includes households who have full legal documentation of ownership, as well as those who do not. Findings from an ongoing AID study of Ecuador's informal housing production sector suggests that a large and growing share of low-income owners in both Quito and Guayaquil lack legal title to their land, and that, in the absence of full legal documentation of ownership, these households cannot take advantage of most formal sector financing opportunities.

Therefore, we have decided that it is essential to distinguish owners with complete documentation from those lacking complete documentation, even though the Census does not provide this distinction. Data from the informal sector study are being used to support estimates of the share of owners who lack full legal title. No data appear to be available, however, to distinguish room renters from conventional unit renters. As a result, we modified the four standard HQM categories as follows 1) owners with full documentation; 2) owners lacking full documentation; 3) renters; and 4) others.

#### Treatment of New Households

A central feature of the housing problems experienced in Quito and Guayaquil during recent years has been that households at all income levels have had increasing difficulty gaining access to the types of housing solutions that were previously affordable. High inflation, poor legal titling, limited availability of formal housing finance, and slow extension of piped water to new settlements are all contributing factors. Therefore, it is critical that the Model be capable of simulating the deterioration of housing circumstances which most knowledgeable observers believe has occurred since 1984.

The HQM's original treatment of net additions to the number of households did not accurately reflect this historical pattern. Specifically, the original version of the Model simulated the addition of net new households as follows:

- 1) The analyst specified the number of net new households in each income-tenure category.
- 2) The Model then allocated the additional households in each income-tenure category across dwelling status categories, according to the base-year housing conditions among households in the same income-tenure category.
- 3) The Model did not test to determine whether net additional households could afford the units to which they were assigned.

- 4) Private sector formal housing finance was distributed among eligible households after their dwelling assignments were made, and had no effect on housing outcomes.

We have revised this segment of the HQM program code substantially, so that housing outcomes for net new households are now explicitly simulated as follows:

- 1) The analyst still specifies the number of net new households in each income-tenure category.
- 2) For renters and others, the Model continues to allocate the new households across dwelling status categories, according to the base-year housing conditions among households in the same income-tenure category.
- 3) For owners (both with and without full documentation), the Model determines the maximum dwelling value that each category of newcomers can afford -- both with and without a conventional, market rate loan from the formal financial sector.
- 4) The Model attempts to assign newcomers in a given income-tenure category to the best dwelling status they can afford with formal financing. If formal financing is available for households in this income-tenure category occupying this type of dwelling, then the Model determines how many households can be served by the funds available, and assigns that number of households to the dwelling status.
- 5) The Model repeats this process for all of the dwelling status categories that households in a given income-tenure class can afford and for which financing is available.
- 6) If there are still unallocated newcomers in the income-tenure category, the Model assigns them to the dwelling status categories that they can afford without formal financing, or to the lowest dwelling status category, if none are affordable.

While this new treatment of newcomers to the housing sector complicates the Model significantly, it also substantially improves the Model's capacity to simulate deterioration in housing conditions, and it makes housing outcomes more sensitive to the volume and allocation of formal housing finance, even in the absence of explicit government loan programs.

## 2. CONSTRUCTING DATA SETS FOR QUITO AND GUAYAQUIL

### Base-Year Data

The central organizational framework of the HQM is a matrix that classifies households according to their income, tenure, and dwelling and infrastructure adequacy. The biggest data collection challenge involved in implementing the Model is to construct this matrix, which involves estimating how households are distributed across income, tenure, and dwelling and infrastructure adequacy categories. As discussed earlier, we have relied upon 1982 Census data, other recent publications, and the informed opinions of AID staff members to arrive at 1984 household distributions for both Quito and Guayaquil. We then relied upon the HQM itself to simulate changes that occurred between 1984 and the end of 1987, producing the 1987 household distributions that provide a basis for our subsequent policy simulations. Given the limited availability of data for Ecuador, the current implementation of the HQM employs only five income categories. Tenure categories are defined as 1) owners with full documentation; 2) owners lacking fully documentation; 3) renters; and 4) others.

The first step in the process of constructing a base year household classification matrix is to define income categories, and to determine the average income and the number of households in each category. As a starting point, we reviewed the Housing Needs Assessment (HNA) estimates of mean incomes by quintile for all metropolitan households, including both Quito and Guayaquil:

### HNA Estimates of Mean Monthly Income by Quintile

#### All Metropolitan Households

	(1984 sucres)	(1988 sucres)
Quintile 1	s/. 10,221	s/. 21,444
Quintile 2	s/. 22,318	s/. 46,823
Quintile 3	s/. 25,449	s/. 53,390
Quintile 4	s/. 49,225	s/. 103,274
Quintile 5	s/. 100,536	3./ 210,925

A 1987 report by the Instituto Latinoamericano de Investigaciones Sociales (ILDIS) presents income distributions for Quito and Guayaquil separately, from the 1977 Encuesta de Hogares.<sup>1</sup>

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1. These distributions are of special interest because they also provide the distribution of households by tenure for each income class, which is critical for the next step in the process of constructing a matrix of households by income, tenure, and dwelling and infrastructure adequacy.

We have inflated the 1977 income ranges in the ILDIS report to 1984 sucres, and constructing income categories that closely approximate quintiles for Quito and Guayaquil, respectively:

Distribution of Households by Monthly Income -- ILDIS

	Mean monthly income (1984 sucres)	Share of Households	
		Quito	Guayaquil
Group 1	s/. 10,584	21%	18%
Group 2	s/. 17,640	21%	25%
Group 3	s/. 31,752	26%	19%
Group 4	s/. 52,920	16%	26%
Group 5	s/. 100,536	16%	12%

These two distributions tend to validate the HNA quintile estimates, and suggest that the differences between Quito and Guayaquil are not substantial. Because quintiles are widely used and easily understood, we have adopted the 1984 HNA estimates of mean income by quintile.

By definition, each income quintile encompasses 20% of the households in the population. In 1982, urban Quito had a population of 188,828 households and urban Guayaquil had a population of 235,664, according to the Censo de Vivienda. However, in "Characteristics and Indicators of Ecuador's Population," Whitaker states that the 1982 census significantly undercounted households and provides INEC's updated population estimates for 1982. We have adjusted the household counts accordingly, to yield 200,204 households in Quito and 249,943 households in Guayaquil as of the end of 1982.

Next, we used INEC's updated 1982 population counts along with its population projections for 1988, to yield estimates of the rate of growth for Quito and Guayaquil over the 1982 to 1988 period. These INEC data indicate that the number of households in urban Quito has increased 4.35% per year on average from 1982 to 1988, while the number of households in urban Guayaquil has increased 4.28% per year on average. Applying these growth rates yields the following 1984 household counts for Quito and Guayaquil:

Number of Urban Households in 1984

	Quito	Guayaquil
Total Households	218,000	271,796
Households per Quintile	43,600	54,359

The next step involved in constructing the base-year household classification matrix is to distribute households in each income class across tenure categories. Census data allow us to differentiate owners from renters and other households, and the ILDIS report provided cross-tabulations of tenure by income categories for both Quito and Guayaquil.

Distribution of Households by Income and Tenure

	Quito			Guayaquil		
	Propia	Arrendada	Otros	Propia	Arrendada	Otros
Quintile 1	21%	62%	17%	47%	41%	13%
Quintile 2	25	63	12	44	47	9
Quintile 3	34	56	10	40	54	6
Quintile 4	51	44	5	46	49	6
Quintile 5	60	38	2	55	43	2

However, as discussed earlier, the category of "propia" includes households who have full legal documentation of ownership, as well as those who do not. No empirical data are currently available to indicate what share of owners-occupants in Quito and Guayaquil lacked full documentation in 1982, although AID's ongoing informal sector study has produced some estimates of the share of production in both cities that has occurred informally. Based on these data, and on informed opinion, we have estimated that 25% of Quito owners and 60% of Guayaquil owners lacked fully documentation of ownership, as of 1984.<sup>1</sup>

But what share of owners in each income category lack full documentation of ownership as of 1984? Our best guess is that the share of owners who lack documentation is highest among low income households, and lowest among the highest income households in both Quito and Guayaquil.

Estimated Distribution of Households by Tenure

	Quito			
	Owners with Doc	Owners No Doc	Renters	Others
Quintile 1	10%	11%	62%	17%
Quintile 2	15	10	63	12
Quintile 3	25	9	56	10
Quintile 4	45	6	44	5
Quintile 5	60	0	38	2

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1. As discussed further below (in the context of annual transitions data), we have estimated that the share of undocumented owners in both cities has increased over the 1984 to 1987 period.

## Guayaquil

	Owners with Doc	Owners No Doc	Renters	Others
Quintile 1	5%	42%	41	13%
Quintile 2	4	40	47	9
Quintile 3	12	28	54	7
Quintile 4	29	16	49	6
Quintile 5	52	3	43	2

The next task is to define the Model's three structure categories and two infrastructure categories. Specifically, what types of structures should be considered "fully adequate," "upgradeable," and "inadequate"? And what infrastructure services must a household have to be considered fully acceptable? Based largely on the HNA, and on 1982 Census data on the distribution of urban Quito households by tipo de vivienda, we started with the following, preliminary definitions:<sup>1</sup>

Base-Year Dwelling Units by Type of Structure

	Quito	Guayaquil
Permanent structures:	88.3%	84.1%
Caso o villa		
Departamento		
Cuartos en Casa		
Semi-permanent structures:	10.6%	14.2%
Mediagua		
Rancho o Covacha		
Choza		
Improvised structures:	1.2%	1.7%
Otros		
Locales no destinados para vivienda		
No Declarado		

However, not all "permanent" structures are in fact fully adequate -- either in terms of physical condition or

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1. Note that, in the HNA, mediaguas were classified as permanent structures. These units are defined as "one story construction with walls of adobe, mud or wood and with a roof of tile or metal." If they are included in the permanent structure category, then 98% of the dwellings in urban Quito are fully adequate structurally, and less than 1% are semi-permanent.

crowding. After considerable discussion, we estimated that dwellings should be distributed across normative adequacy categories as follows:

Base-Year Dwelling Units by Structure Adequacy

	Quito	Guayaquil
Fully Adequate	75%	60%
Upgradable	20%	20%
Non-Upgradable	5%	20%

We have used the household's primary source of water as our indicator of infrastructure adequacy. Ultimately, it may make sense to incorporate sewage disposal, which is also available in the 1982 Censo de Vivienda, but this would complicate the data assembly process substantially, and probably would not add much to the simulation results at this exploratory stage. The standard of infrastructure adequacy agreed upon is piped water within the dwelling unit. Thus, households who live in apartment buildings which have running water in the building but not in the individual units are counted as unacceptable, along with households who live in barrios where there is a central standpipe but no individual house connections.

Base-Year Dwelling Units with Adequate Water Service

Quito	Guayaquil
62.3%	51.9%

Note that these data do not necessarily suggest that 62% of households in urban Quito or 52% of households in urban Guayaquil have water piped into their homes today. These data apply to our base simulation year -- 1984.

To estimate the joint distribution of households by structure and infrastructure adequacy, we use the 1982 Census tabulations of Tipo de Vivienda by Abastecimiento de Agua for all urban areas. As detailed in Annex A and B, we adjusted the reported joint distribution to reflect our estimated distribution of dwelling units by structure adequacy.

Estimated Base-Year Distribution of Dwelling Units  
by Structure and Infrastructure Adequacy

	Quito	Guayaquil
Permanent Structures		
Acceptable Water	50%	40%
Unacceptable Water	25%	25%
Semi-Permanent Structures		
Acceptable Water	5%	5%
Unacceptable Water	15%	15%
Improvised Structures		
Acceptable Water	1%	5%
Unacceptable Water	4%	10%

The final -- and perhaps most daunting -- task involved in constructing the base-year household classification matrix is to combine the estimates assembled thus far into a joint distribution of households by income, tenure, structure and infrastructure adequacy. To the greatest extent possible, we relied upon 1982 Census tabulations, which relate tenure to structure type and structure type to infrastructure adequacy, along with the 1977 ILDIS tabulations relating income to tenure. However, at every stage, we adjusted the results to correspond more closely to normative definitions and to informed opinion about basic housing circumstances in Quito and Guayaquil.

In addition, none of the available data sources told us anything about differences between owners with full documentation and owners lacking full documentation. Therefore, we assumed that owners without full documentation may live in permanent or semi-permanent dwelling units, but are relatively unlikely to have water piped into their buildings. We also assumed that, in every tenure category, low income households are more likely to live in inadequate circumstances than affluent households. Annexes A and B detail the process we employed to construct the final household classification matrix for Quito and Guayaquil, respectively.

In addition to the household classification matrix, three more pieces of information are needed to complete a base-year input data set. First, we need to estimate the entry costs for the Model's six dwelling status categories. For each dwelling status category, the entry cost should reflect the minimum purchase price required to buy a unit that meets the standards of the category. To illustrate, the entry cost for dwelling status 6 -- improvised unit on an unserviced site -- should correspond to the lowest price households pay to acquire an unserviced, undocumented lot and to erect an improvised shelter. It should not necessarily reflect the cost of raw land to conventional developers or to public sector projects.

The entry cost estimates developed for Quito and Guayaquil assume that the typical lot is 100 square meters, and that the minimum, fully adequate dwelling unit is 36 square meters. They have been scaled down from current estimates, to reflect the high rate of inflation over the last eight months. These costs are slightly lower than the costs of BEV projects, which are currently designed to serve the median income households.

Entry Costs for Dwelling Status Categories

		(Jan 1988 sucres)
Fully Adequate Structure		
1.	Infrastructure Acceptable	s/. 975,000
2.	Infrastructure Unacceptable	s/. 575,000
Upgradable Structure		
3.	Infrastructure Acceptable	s/. 750,000
4.	Infrastructure Unacceptable	s/. 350,000
Non-upgradable Structure		
5.	Infrastructure Acceptable	s/. 575,000
6.	Infrastructure Unacceptable	s/. 175,000

Next, we need to estimate the share of income available for housing -- what share of income can households in each income group make available on a monthly basis for housing? The estimates used in the 1984 HNA for Quito and Guayaquil are quite consistent with those we used recently in an HQM implementation for Honduras. We have adopted the HNA estimates for both Quito and Guayaquil.

Share of Income Available for Housing

	HNA	Honduras HQM
Quintile 1	25%	20%
Quintile 2	30%	25%
Quintile 3	30%	30%
Quintile 4	30%	30%
Quintile 5	25%	30%

The last base-year data item is the savings/informal finance mobilization rate. This factor represents the estimated amount of capital households can raise from savings and informal sources when a housing need or opportunity arises. It is expressed as a share of annual income. In other applications, we have used a mobilization rate of 25%. In other words, we estimated that households can be expected to come up with about three months worth of income (from savings or by borrowing from informal sources) to obtain housing. Note that when the Model is used to

simulate various housing programs, higher mobilization rates can be assumed for program participants, to reflect households' expected response to special housing opportunities.

### Annual Transitions Data

Starting with the base-year household classification matrix, the HQM simulates year-to-year changes in the distribution of households across tenure and dwelling status categories. To do so, the Model needs to be provided with information about changes occurring in each simulation year. In this section, we describe annual transitions data for our calibration period -- 1985 through 1987. The next section focuses on assumptions adopted for our policy simulations, which extend through 1992.

First, we need to know the annual inflation rate. Although this item is never entered in a Model data set, standard inflation rate measures are needed to adjust all currency amounts into January 1988 sucres. In addition, the Model needs to be provided with market interest rates -- the expected nominal interest rate for housing investment.

### Annual Inflation and Market Interest Rates

	1985	1986	1987	1988
Inflation Rate	24.4%	27.3%	32.5%	64.6%
Interest Rate	27.4%	29.4%	31.4%	64.0%

Next, we need estimates of the annual rate of real income growth. Are incomes keeping pace with inflation or are they falling behind? This issue has generated considerable debate and uncertainty, due to the general shortage of data on the distribution of income in Ecuador. The 1984 HNA assumed an annual real rate of income growth of 4.1% from 1984 through 1989. However, a 1988 report on poverty in Ecuador reports that real, per capita GDP fell by an average of -1.2% annually over the 1982-1987 period.

We have adopted this estimate of real income growth despite two serious reservations. First, we suspect that incomes for some groups have kept pace with inflation, while others have fallen behind. The Model can accommodate different income growth rates for different income classes, but we have concluded that at this stage, there is insufficient data to estimate variable rates.

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1. While this decline was not smoothly distributed over the 1985-1987 period, we have decided that there is no particular advantage in simulating the timing of decline in real income levels, and we have applied a -1.2% real income growth rate for each year in our calibration period.

The minimum wage appears to have been adjusted fairly regularly to keep up with inflation, especially during the last several years, while salaries for professional workers have been eroded by inflation. However, there is no convincing data to indicate which segments of the income distribution are dominated by minimum wage earners, or how seriously real salary levels have declined. Our second serious concern about the income growth estimate is that little is known about income levels in the informal sector. Since this income is probably not reflected in GDP figures, the overall rate of per capita income growth may be incorrect, and the experience of households in the informal sector may be quite different than the experience of formally employed workers.

In addition to the rate of real income growth, the Model needs to know the real dwelling cost inflation rate. Are housing costs expected to rise faster than inflation, to keep pace with inflation, or to rise more slowly? The 1984 HNA assumed that construction costs would grow at the overall inflation rate, and we have come upon no evidence to suggest that this assumption was incorrect. Therefore, we have adopted a zero rate of dwelling cost inflation.

Perhaps the most significant source of change in urban housing conditions is the addition of new households to the sector each year. The Model needs to be provided with annual estimates of the number of net new households in Quito and Guayaquil, as well as the distribution of these households across income and tenure classes.

The 1984 HNA assumed that the number of metro households would increase by 17,530 households per year between 1984 and 1989. This implies an annual household growth rate of about 3.8% per year since 1984 for both Quito and Guayaquil. AID's Otterbein et al report of 1987 estimated a 5.2% growth rate for Quito during the 1980s, and the report on poverty in Ecuador reports a 4.6% growth rate for 1982 to 1987. However, we found the estimates in the Whitaker report -- 4.35% for Quito and 4.27% for Guayaquil -- the most compelling because the use adjusted Census figures, and Census forecasts of 1988 population for Quito and Guayaquil.

Applying these growth rates to our 1984 household population estimates yields the following estimates of growth in the number of households for the two urban areas:

<u>Change in the Number of Urban Households</u>		
	Quito	Guayaquil
Annual Growth Rate	4.35%	4.27%
1988 Households	247,705	308,062
New Households per Year	9,500	11,624

We have divided these net newcomers evenly by decile, because there is no compelling evidence that the income distribution is changing significantly. This yields 1,900 new households in each quintile per year for Quito, and 2,425 households per year in each quintile in Guayaquil.

We propose to retain the existing distribution of households who own versus those who rent within each income quintile. Since the 1977 ILDIS distribution of households by tenure is virtually identical to the 1982 Census distribution, there is no reason to think that the share of owners has been increasing or decreasing significantly. However, AID's ongoing study of informal housing production strongly suggests that more owners are buying property without full documentation.

For Quito, we have assumed that 50% of new owners lack documentation, while in Quito, the share is 80%. And, as a first guess, we have estimated that net new households are distributed as follows:

Distribution of Additional Urban Households by Tenure

Quito				
Quintile	Owners with Doc	Owners No Doc	Renters	Others
1 (low)	0%	21%	62%	17%
2	5	20	63	12
3	15	19	56	10
4	40	11	44	5
5 (high)	60	0	38	2

  

Guayaquil				
Quintile	Owners with Doc	Owners No Doc	Renters	Others
1 (low)	3%	44%	41%	13%
2	3	41	47	9
3	2	38	54	6
4	32	13	49	6
5 (high)	52	3	43	2

Next, we need to estimate the dwelling replacement rate -- the share of existing housing units that can be expected to drop out of the stock annually as a result of depreciation or demolition. The HNA assumed a rate of 2% per year, which is a fairly standard assumption. We have continued to use it.

In past implementations of the HQM we have entered a matrix of annual dwelling transition rates. This matrix reflects the rates at which dwellings are gradually upgraded, even in the absence of

any public sector assistance. For our Quito and Guayaquil implementations, however, we have set this transition matrix to zeroes, for three reasons. First, no data are available to document the share of upgradable dwellings that effectively shift to fully adequate status each year. Second, our understanding is that, at least over the last several years, there has been no net increase in the number of households in either Quito or Guayaquil who have water piped into their units. Finally, and most significantly, we feel that the Model's new treatment of households added to the sector effectively simulates net changes in the housing conditions of various income. Therefore, it may no longer be necessary to exogenously estimate dwelling transition rates.

### Formal Sector Housing Finance

The HQM incorporates formal housing finance in two basic ways. First, the volume and allocation of mortgage lending by private financial institutions is incorporated into the annual transitions data. Under the revised version of the Model, these funds are drawn down by eligible households among the net newcomers to the sector, and determine the quality distribution of incremental housing units. Lending by public sector institutions is incorporated into the Model by defining a formal finance policy, which specifies the volume of loans, the lending terms (including below-market interest rates, if applicable), and the allocation among types of households.

For our 1985-1987 calibration simulations, we have pooled S&L and commercial bank lending together in the annual transitions data, while credit union lending, as well as BEV and IESS loans have been handled as formal finance policies. Credit union lending is entered into the Model as a "policy" because its terms and allocation are so different from those of the S&Ls and commercial banks, and because one of the alternative policy packages to be simulated for 1988-1992 expands credit union lending substantially. However, when we compute the aggregate impacts of public policies over the 1985-1987 period, credit union lending is not included.

The volume of lending by various public and private financial institutions was obtained from AID's Shelter Sector Finance Strategy report, which assumes that about 70% of formal sector lending goes to households in Quito and Guayaquil, with a 45/55 split between the two cities. Data from BEV's 1988 Annual Report was used to estimate the relative size of its home purchase and home improvement lending programs. IESS funds are assumed to be evenly divided between home purchase and home improvement lending.

Conventional Private Sector Lending

	S&Ls	Commercial Banks
Total Lending (in Jan. 1988 s/.1,000,000s)		
Quito:		
1985	527.60	341.57
1986	447.84	409.25
1987	458.96	488.00
Guayaquil:		
1985	644.84	417.47
1986	547.36	500.19
1987	560.95	596.44
Share of funds to:		
Quintile 1	0	0
Quintile 2	0	0
Quintile 3	0	0
Quintile 4	40%	0
Quintile 5	60%	100%

Only owners with full documentation, occupying fully acceptable units with adequate infrastructure are eligible to receive these loans.

Credit Union Lending

Total Lending (in Jan.  
1988 s/.1,000,000s)

Quito:	
1985	2005.00
1986	2005.00
1987	2007.81

Guayaquil:	
1985	2455.00
1986	2455.00
1987	2453.99

Share of funds to:

Quintile 1	0
Quintile 2	0
Quintile 3	50%
Quintile 4	50%
Quintile 5	0

All owners can obtain credit union loans, regardless of the quality of the dwellings they occupy, and regardless of whether they have complete documentation of ownership.

BEV and IESS Lending

Total Lending (in 1988 s.1,000,000s)	BEV		IESS	
	Home Improvements	House Purchase	Home Improvements	House Purchase
Quito:				
1985	434.51	289.67	2777.20	2777.20
1986	964.07	1178.31	3150.55	3150.55
1987	1084.86	1627.29	2689.47	2689.47
Guayaquil:				
1985	531.07	354.04	3394.35	3394.35
1986	1178.31	1440.15	3850.68	3850.68
1987	1325.94	1988.91	3287.13	3287.13
Interest Rate	19%	19%	16%	16%
Loan Term	10	20	5	15
Max Loan Amount (s/.1,000,000)	0.45	1.00	0.5	2.50
Minimum Dw Status (after participation)	1	1	1	1
Eligible Tenure Groups				
Owners w/Doc	yes	yes	yes	yes
Owners no Doc	yes	no	no	no
Renters	no	yes	no	no
Others	no	yes	no	yes
Title Obtained (after participation)	yes	yes	yes	yes
Percent to:				
Quintile 1	0%	0%	0%	0%
Quintile 2	40%	40%	0%	0%
Quintile 3	60%	60%	33%	33%
Quintile 4	0%	0%	33%	33%
Quintile 5	0%	0%	33%	33%

Calibration Results -- 1984 to 1987

Based on the data outlined above, we simulated the 1985-1987 period for Quito and Guayaquil, first omitting the activities of public sector institutions (BEV and IESS), and then including them. These simulations reflect the implications of the many assumptions we have made about trends in Ecuador's housing sector over the past several years. Thus, they provide an opportunity

to assess the validity of these assumptions. In addition, the outcomes of the simulations which include BEV and IESS activities provide the starting point for our subsequent simulations of the 1988-1992 period, under alternative policy scenarios.

In both Quito and Guayaquil, the share of households living in fully adequate structures with piped water in their units would have declined significantly between 1984 and the present, had it not been for BEV and IESS lending.

Share of Households in Fully Adequate Units with Piped Water

	Quito			Guayaquil		
	1984	1987 No Govt.	1987 BEV&IESS	1984	1987 No Govt.	1987 BEV&IESS
Q1	17%	17%	17%	17%	16%	16%
Q2	23	23	25	21	19	23
Q3	50	47	51	36	27	37
Q4	74	70	71	49	36	43
Q5	86	80	81	49	36	43
Total	50	47	49	54	52	60

The effects of BEV and IESS lending have been greater in Guayaquil than in Quito because we have assumed that there are more households with relatively high incomes in Guayaquil who started out in unacceptable circumstances. Thus, in Guayaquil, households in quintiles four and five who obtain BEV or IESS loans are more likely to use these loans to upgrade their housing circumstances from unacceptable to fully acceptable. By contrast, affluent households in Quito who obtain these loans are more likely to occupy acceptable housing already.

While BEV and IESS lending has prevented significant deterioration in the share of households occupying fully adequate units with piped water, they have been less effective with respect to water services per se. In both Quito and Guayaquil, the share of households with water piped into their units (regardless of structure quality) has declined since 1984, and the decline would have been only slightly greater in the absence of BEV and IESS.

Share of Households with Piped Water

	<u>Quito</u>			<u>Guayaquil</u>		
	1984	1987 No Govt.	1987 BEV&IESS	1984	1987 No Govt.	1987 BEV&IESS
Q1	26%	25%	25%	31%	30%	30%
Q2	35	34	34	40	37	37
Q3	54	50	53	46	35	40
Q4	80	74	75	64	47	49
Q5	90	85	85	71	69	70
Total	71	53	54	50	43	45

Thus, BEV and IESS appear to have been more effective in helping households who already have piped water upgrade their structures, than in helping a larger share of households obtain units with piped water.

BEV and IESS programs also have not been effective in providing more households access to the formal financial sector. The share of households who own their units without full legal documentation has remained essentially the same since 1984, although newcomers have a relatively high probability of lacking documentation, in both Quito and Guayaquil. BEV and IESS are unlikely to be of assistance of undocumented owners, because these households are ineligible for home improvement loans, and are unlikely to sell their current lots to participate in home purchase programs.

Share of Households who are Owners without Legal Documentation

	<u>Quito</u>			<u>Guayaquil</u>		
	1984	1987 No Govt.	1987 BEV&IESS	1984	1987 No Govt.	1987 BEV&IESS
Q1	11%	12%	12%	43%	43%	43%
Q2	10	11	11	40	40	40
Q3	9	10	10	28	29	29
Q4	6	10	10	16	15	15
Q5	0	0	0	3	3	3
Total	7	8	8	26	26	26

Only a minority of the households who participate in BEV and IESS programs shift from inadequate housing circumstances to fully adequate circumstances as a result of participation. Low income participants are the most likely to achieve a shift of this

magnitude, since a smaller share of those who qualify already occupy fully adequate units. Among more affluent households, however, participants are more likely to occupy adequate units before program participation. This pattern is more pronounced in Quito than in Guayaquil, since affluent households in Guayaquil are more likely to occupy substandard housing than their counterparts in Quito.

Recipients of BEV and IESS Loans

1985-1987

<u>Quito</u>		<u>Guayaquil</u>	
Participants	Achieving Acceptable Housing	Participants	Achieving Acceptable Housing
Q1	0	0	0
Q2	2190 ( 8%)	1402 (64%)	4246 ( 8%)
Q3	11910 (41%)	1671 (14%)	23468 (43%)
Q4	7213 (25%)	692 (10%)	13400 (24%)
Q5	7432 (26%)	221 ( 3%)	13815 (25%)
Tot	28746(100%)	3984 (14%)	54938(100%)
			11692 (21%)

Because the majority of participants in these programs do not shift from unacceptable to acceptable housing, the cost (both in total loan funds, and in the present discounted value of interest subsidies) per household that does achieve such a shift is high.

Efficiency of BEV and IESS Lending Programs

	Quito	Guayaquil
Total Loans		
per hh served	s/. 742,677	s/. 507,532
per hh shifting	s/.5,358,685	s/.2,384,773
Effective Subsidy		
per hh served	s/. 226,084	s/. 157,576
per hh shifting	s/.1,631,325	s/. 740,413

### 3. ALTERNATIVE POLICY SCENARIOS

#### Overview of the Alternative Scenarios

The HQM can be used to simulate and evaluate a very wide range of policy alternatives. The Model can accommodate four generic types of housing assistance programs: 1) programs that expand the availability or modify the terms of formal housing finances; 2) programs that provide legal title to owners who lack full documentation of ownership; 3) programs that extend infrastructure services to existing dwellings with inadequate services; and 4) programs that produce either serviced sites or completed housing units. Any number of specific programs can be combined into a policy package and simulated with the HQM. Moreover, the impact of different policy packages under varying economic and demographic assumptions can be tested by modifying other input data items. Finally, since the Model can produce results at any interval for virtually any simulation period, it can be used to explore the rate at which improvements in housing conditions would be achieved under alternative policy packages or alternative implementation schedules.

As AID's information about Ecuador's housing sector is refined and its dialog with the new government evolves, increasingly detailed and explicit policy alternatives can be simulated with the HQM. Currently, however, the Model can best be used to explore the relative advantages of broad, illustrative policy scenarios. More detailed program simulations would be inappropriate at this point, both because much of the data upon which the Model relies is approximate, but also because the terms of AID's policy discussions with Ecuador's new national government are not fully defined.

We have used the HQM to test four illustrative policy alternatives, under three sets of economic assumptions for the next five years. These policy packages are intended to illustrate how effectively the Ecuador's urban housing sector might operate if key constraints were eliminated. For the time being, we are less concerned with analyzing how these constraints might be lifted than with the changes in housing outcomes that would result if they were lifted. Thus, the Model results will illustrate the potential impacts of programs that address key constraints on the effective operation of the urban housing sector in Ecuador.

Each of the four policy alternatives presented in this section assumes that a key constraint has been lifted:

1. Urban infrastructure standards have been modified so that the cost of a serviced site is 15% lower, and the water authorities of Quito and Guayaquil are extending service to several thousand households each year.

2. The municipal government of Quito is able to provide full legal title for all new land purchases, and provides legal documentation of ownership at a nominal fee to existing owners who lack full legal title. In addition, BEV's lending practices are revised to include small to households in quintile 1 for the purchase of serviced sites, and the IESS lending program is extended to serve households in quintiles 2 through 5.
3. Savings and loan associations once again allocate a larger share of their assets to housing -- effectively doubling their annual loan volume. Under the first option of this scenario, there is no change in the distribution of S&L lending, but under the second option, loans are made to households in quintiles 3 through 5.
4. Loans are made to landlords for the renovation of deteriorated rental housing and the construction of new apartment buildings.

These four packages are simulated cumulatively for the 1988 to 1992 period in relation to a base case scenario, which reflects current programs of BEV (with World Bank and IDB funding), AID (under the HG-007 loan), and IESS. Three economic forecasts are tested:

1. Continuation of current conditions --

inflation at 50%  
market interest rates at 54%  
real income growth at 0

2. Optimistic forecast --

inflation at 15%  
market interest rates at 19%  
real income growth at 3%

3. Pessimistic forecast --

inflation at 100%  
market interest rates at 104%  
real income growth at -1%

The remainder of this section describes the base case and each alternative policy scenario, summarizing simulation results under current economic conditions. We then focus on the impact of inflation on the outcomes of alternative policy scenarios.

### The Base Case

The base case represents housing programs currently scheduled to be in operation in Ecuador over the next five years. In effect, therefore, this constitutes a "no further action" scenario

BEV Lending -- 1988-1992

Total Lending (in 1988 s.1,000,000s)	Serviced Sites	21m <sup>2</sup> Houses	36m <sup>2</sup> Houses	Home Improvements
Quito	518.18	1012.28	3632.55	3218.67
Guayaquil	633.33	1237.24	4439.79	3393.33
Interest Rate	21.5%	21.5%	21.5%	21.5%
Loan Term	20	20	20	5
Max Loan Amount (s/.1,000,000)	0.3	0.9	1.25	0.3
Minimum Dw Status (after participation)	5	1	1	1
Eligible Tenure Groups				
Owners w/Doc	yes	yes	yes	yes
Owners no Doc	no	no	no	no
Renters	yes	yes	yes	no
Others	yes	yes	yes	no
Title Obtained (after participation)	yes	yes	yes	yes
Percent to:				
Quintile 1	0%	0%	0%	0%
Quintile 2	50%	0%	0%	40%
Quintile 3	50%	50%	0%	60%
Quintile 4	0%	50%	100%	0%
Quintile 5	0%	0%	0%	0%

IESS and HG-007 Lending -- 1988-1992

Total Lending (in 1988 s.1,000,000s)	IESS Home Imps.	HG-007 Loan Program
Quito	2,689.47	2,406.25
Guayaquil	3,287.13	2,406.25
Interest Rate	16%	54%
Loan Term	5	20
Max Loan Amount (s/.1,000,000)	0.975	1.250
Minimum Dw Status (after participation)	1	5
Eligible Tenure Groups		
Owners w/Doc	yes	yes
Owners no Doc	no	no
Renters	no	yes
Others	no	yes
Title Obtained (after participation)	yes	yes
Percent to:		
Quintile 1	0%	33%
Quintile 2	0%	33%
Quintile 3	33%	33%
Quintile 4	33%	0%
Quintile 5	33%	0%

against which all alternative policy packages can be compared. Under this scenario, many of the conditions that characterized our calibration solutions persist -- the high cost of serviced land, declining rate of water coverage, and poor land titling are all sustained through 1992. In addition, the volume and terms of lending by S&Ls, commercial banks, and credit unions are assumed to remain at their 1987 levels (although market interest rates vary with the economic forecast).

There are, however, three important differences between the 1988-1992 base case scenario and our calibration solutions. First, BEV lending is modified to reflect the World Bank/IDB program for 1988-1992 (see tables on the preceding pages).<sup>1</sup> Second, IESS is assumed to stop making long-term home purchase loans but to continue making short-term home improvement loans at below market interest rates. And finally, AID's HG-007 loan program is implemented for 1988-1991, expanding S&L and commercial bank lending to households in income quintiles 2 and 3 at market interest rates.

Under prevailing economic conditions, this base case policy scenario produces virtually no improvement in urban housing conditions over the 1988-1992 period, despite its substantial cost. In Quito, the total share of households living in fully adequate housing declines over the period under this scenario, while Guayaquil experiences a 2 percentage point increase in the share of households in fully adequate housing.

The primary impact of the base case scenario is to target loans (through the HG-007 program) for home improvements, serviced sites, and modest homes to households in the bottom three income quintiles, who cannot otherwise afford to participate in the formal financial sector. In Quito, about two thirds of all public sector lending goes to households in quintiles 2 and 3, with households in the lowest quintile unable to afford participation, even at below-market interest rates. In Guayaquil, 15% of the funds go to households in quintile 1 and 62% go to households in quintiles 2 and 3. Households in quintile 1 are able to participate in public sector programs in Guayaquil because income levels overall are slightly higher there.

1. For all BEV programs, we used the World Bank's 1988 estimates, converting dollars to sucres at the official rate (390). We then allocated 70% of program funds to Quito and Guayaquil, with 45% to Quito and 55% to Guayaquil.

Recipients of Base Case Policy Assistance

1988-1992

	Quito		Guayaquil	
	Participating	Achieving Acceptable Housing	Participating	Achieving Acceptable Housing
Q1	0	0	4259 (15%)	0
Q2	10996 (18%)	2909 (26%)	12373 (15%)	4971 (40%)
Q3	30064 (48%)	1111 (4%)	37810 (47%)	7480 (5%)
Q4	12132 (19%)	872 (7%)	13154 (16%)	2076 (16%)
Q5	9355 (15%)	1724 (18%)	12870 (16%)	823 (6%)
Tot	62547(100%)	6616 (11%)	80466(100%)	15350 (19%)

Because so few households in the bottom three income quintiles currently have adequate infrastructure, the availability of serviced sites and modest homes has a significant impact on the overall level of housing quality. In Guayaquil, almost one fifth of all households who receive public sector loans under the base case scenario achieve fully acceptable housing as a result. And 40% of the quintile 2 participants are successful in achieving fully adequate housing. In Quito, a much smaller share of the program participants (11%) are able to achieve fully adequate housing.

While the base case policy scenario appears to yield significant gains for households in quintiles 2 and 3, households in quintiles 4 and 5 actually lose ground over the 1988-1992 period. This explains why, in Quito, the base case scenario results in an overall reduction in the share of households who live in fully adequate housing. Housing conditions deteriorate for high income households because serviced sites are so costly, and because, once a house has been built on an unserviced lot, the household is dependent upon public sector action to extend infrastructure services to the dwelling unit. In other words, households cannot, for the most part, upgrade their infrastructure services without public sector intervention. Over the 1988-1992 period, the share of households in the highest income quintile who live in units with piped water declines from 85% to 79% in Quito and from 85% to 82% in Guayaquil.

Share of Households by Quintile  
in Fully Adequate Housing with Piped Water

Base Case Policy Scenario

Income Quintile	Quito		Guayaquil	
	<u>1987</u>	<u>1992</u>	<u>1987</u>	<u>1992</u>
1-low	17%	16%	12%	11%
2	25	29	18	23
3	50	48	36	43
4	71	66	55	53
5-high	81	76	81	79
Total	49	47	40	42

Improving Urban Water Service

Because the high cost of serviced land and the slow extension of water connections is clearly a severe impediment to the improvement of housing conditions in Ecuador, our first policy scenario assumes that key constraints on the distribution of piped water are removed in both Quito and Guayaquil. Specifically, with the base case policies still in effect, the cost of serviced land is reduced 15%, and water connections are extended at a rate that would ensure complete coverage in Quito and Guayaquil by the end of a ten-year period.

Entry Costs for Dwelling Status Categories

(with reduced serviced site costs)

(Jan 1988 sucres)

Fully Adequate Structure			
1.	Infrastructure Acceptable	s/.	828,750
2.	Infrastructure Unacceptable	s/.	575,000
Upgradable Structure			
3.	Infrastructure Acceptable	s/.	637,500
4.	Infrastructure Unacceptable	s/.	350,000
Non-upgradable Structure			
5.	Infrastructure Acceptable	s/.	488,750
6.	Infrastructure Unacceptable	s/.	175,000

There are a number of ways in which these changes could be accomplished. Possibilities include revising infrastructure or land development standards to reduce the cost of producing serviced sites; minimizing fees and taxes that may unnecessarily inflate transactions costs; and charging higher rates for water

service and improving collections, in order to generate the revenues necessary to fund system expansion.

We have assumed that water service is extended to 3,400 households annually in Quito and 2,267 households annually in Guayaquil. All households who live in units that lack adequate water service are eligible to benefit from this program, regardless of income, tenure, or housing condition. In fact, the available number of service extensions are allocated proportionately across the income, tenure, and housing quality distribution each year.

The total cost per household receiving a new water connection is estimated at s/.103,040. Households are expected to contribute roughly one third of this total, or 36,800, while the remaining two thirds is financed by the public sector. No loans are earmarked to finance the household contribution. Therefore, to participate in this program, households must be able to mobilize 36,800 from savings or informal sources. We assume that, given such an opportunity, households can be expected to mobilize up to half of a total year's income if necessary. Given this level of savings/informal mobilization, some households will be able to finance structural improvements at the same time that they receive their water connections.

In both Quito and Guayaquil, this policy scenario yields substantially better outcomes than the base case alone. In Quito, the decline in housing conditions that would otherwise be expected to occur over the 1988-1992 period is averted, while in Guayaquil, the share of households living in fully adequate housing with piped water actually increases substantially over this period.

Share of Households by Quintile  
in Fully Adequate Housing with Piped Water

Infrastructure Policy Scenario

Income Quintile	Quito			Guayaquil		
	1987	1992		1987	1992	
		Base	Infra		Base	Infra
1-low	17%	16%	17%	12%	11%	13%
2	25	29	30	18	23	26
3	50	48	50	36	43	44
4	71	66	73	55	53	61
5-high	81	76	79	81	79	83
Total	49	47	50	40	42	46

About two thirds of all households who receive water connections under this policy scenario achieve fully adequate housing as a result. All of the quintile 4 and 5 recipients achieve fully acceptable housing, either because they started out in adequate dwellings that lacked piped water, or because they could afford to upgrade their structures at the same time that they received water connections. Lower income recipients of water connections achieve fully adequate housing at somewhat lower rates, both because their initial dwelling conditions are worse and because they cannot afford to invest in structural improvements.

### Recipients of Infrastructure Expansion

1988-1992

<u>Quito</u>			<u>Guayaquil</u>		
Participants	Achieving Acceptable Housing		Participants	Achieving Acceptable Housing	
Q1	1983 (22%)	360 (18%)	4026 (24%)	1480 (37%)	
Q2	1815 (20%)	468 (24%)	3815 (22%)	1559 (41%)	
Q3	1333 (15%)	1099 (82%)	2892 (17%)	1989 (69%)	
Q4	1958 (22%)	1958(100%)	3506 (21%)	3506(100%)	
Q5	1981 (22%)	1981(100%)	2762 (16%)	2762(100%)	
Tot	9070(100%)	5866 (65%)	17001(100%)	11296 (66%)	

In all likelihood, these results understate the impacts of a systematic policy of improving infrastructure services. While lower income households cannot immediately achieve fully adequate housing circumstances as a result of program participation, many do afford incremental investments in structural quality at the same time that they receive water connections. Over time, incremental investments of this kind will yield marked improvements in the number of poor households who occupy fully adequate dwellings. Moreover, once water connections have been supplied by the public sector, households at all income levels can achieve structural improvements through their own, independent levels. In other words, this policy scenario eliminates a barrier created by the public sector that interferes with gradual improvements that individual households are capable of undertaking themselves.

### Enhancing Access to Formal Financing

Our next policy scenario assumes that two types of reforms are implemented to expand low income households' opportunities to obtain formal sector financing. First, the land titling system is improved to the point that all newly forming households who are owner occupants are able to obtain full legal title to their properties, and title is regularized for an additional 1,000

untitled properties annually. In addition, both the IESS Home Improvement Lending Program and BEV's Sites and Services Program are extended downward to serve lower income households. Specifically, the IESS Home Improvement loans are reallocated so that each year's funds are evenly distributed across quintiles 2 through 5. Only households in the bottom 20% of the income distribution are excluded from participation. BEV's Sites and Services Program is reallocated to serve the bottom three quintiles, with 20% of annual funding going to quintile 1, 30% to quintile 2, and the remaining 50% to quintile 3.

This policy scenario has been simulated for Quito only. It was determined that Guayaquil's land titling problems are so daunting, particularly given the widespread practices of building low cost housing in wet, marshy areas, that it is not clear how a universal titling program could possibly be accomplished. In Quito, households are required to pay s/. 14,000 to regularize the legal documentation for an occupied property. As in the infrastructure service policy, we assume that households are capable of mobilizing up to half a year's worth of income in response to such an opportunity, and that these funds -- from savings and informal sources -- will be used not only to pay for legal title but also for incremental improvements to structure quality.

Share of Households by Quintile  
in Fully Adequate Housing with Piped Water

Legal Titling Policy Scenario

Quito

Income Quintile	1987	1992	
		Base	Title
1-low	17%	16%	17%
2	25	29	33
3	50	48	51
4	71	66	73
5-high	81	76	81
Total	49	47	51

Almost by definition, this policy scenario substantially increases the share of households in Quito who are able to obtain full legal title to their properties. Altogether, the estimated share of households who own without full documentation drops from

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1. This policy is simulated in conjunction with the changes implemented in the base case and infrastructure policies.

8% in 1987 to 5% in 1992 under this scenario. However, there appear to be relatively few immediate benefits with respect to housing quality. Only 4% of the households whose title is regularized achieve fully adequate housing conditions in the same year, and all of these households are in the fourth quintile. Lower income households simply cannot afford the investment required to upgrade their units.

Again, however, the HQM understates the benefits of this policy intervention. Many households who cannot immediately afford complete improvements to their dwelling units can be expected to undertake gradual improvements. Moreover, one would expect the rate of improvements to be higher once households have obtained full legal title to their properties, both because they are more certain of their security, and because they may be able to obtain home improvement loans from the conventional financial sector.

The reallocation of BEV and IESS loans produce a marked improvement in the share of quintile 2 households who occupy fully adequate housing with piped water. In fact, implementation of both the infrastructure and titling policies results in a much more equitable distribution of total public sector benefits among income groups. Moreover, the share of all public program participants who actually achieve fully adequate housing as a result of their participation is almost twice as high under this scenario (20%) as it was in the base case (11%).

#### Participants in Public Sector Programs

(Base Case plus Infrastructure and Titling)

1988-1992

Quito

	Participants	Achieving Acceptable Housing
Q1	3893 ( 5%)	394 (10%)
Q2	16585 (21%)	4887 (29%)
Q3	34205 (44%)	3101 ( 9%)
Q4	12510 (16%)	3179( 25%)
Q5	10035 (15%)	3431( 34%)
Tot	77228(100%)	15194 (20%)

#### Expanding S&L Involvement in Housing Finance

Our next policy scenario simulates the impacts of a substantial increase in housing lending by conventional financial institutions. Specifically, the total volume of S&L lending is doubled, generating roughly a 50% increase in the total availability of formal housing finance. We first simulate this expansion in the volume of formal finance with no change in the

allocation of funds. In addition, however, we simulate the impacts of reallocating formal housing finance so that each year's funds are evenly distributed among fully title owner occupants in quintiles 3 through 5.

Both of these scenarios produce a small increase in the share of households who live in fully adequate housing with piped water. Under the first variant, gains are limited to households in the highest income quintile; and under the second variant, households in quintiles 4 and 5 share in the housing improvements.

Share of Households by Quintile  
in Fully Adequate Housing with Piped Water

Expanded S&L Policy Scenario

Income Quintile	Quito				Guayaquil			
	1987	1992			1987	1992		
		Base	S&Ls			Base	S&Ls	
		A	B		A	B		
1-low	17%	16%	17%	17%	12%	11%	13%	13%
2	25	29	33	32	18	23	26	26
3	50	48	51	51	36	43	44	44
4	71	66	74	76	55	53	62	63
5-high	81	76	83	83	81	79	86	83
Total	49	47	52	52	40	42	46	46

The limited short-term impact of both variants of the expanded S&L lending scenario is attributable to three factors. First, since S&L lending is not targetted to households currently living in substandard housing, a large share of the increased resources are allocated to households whose housing conditions are already adequate. Second, households living in inadequate housing, particularly those with incomes at or below the median, cannot afford to borrow sufficient funds to achieve significant improvements in their housing conditions. And finally, home improvement borrowing cannot help households who lack adequate infrastructure. In fact, both variants of this scenario have a slightly greater impact on the share of households living in adequate structures than on the share enjoying both adequate structural and infrastructure conditions.

In the longer term, the effects of expanded S&L lending could be more substantial, particularly in combination with an aggressive program of infrastructure upgrading on the part of the public sector. If households can obtain financing to gradually upgrade the quality of their structures at the same time that infrastructure services are being upgraded by the public sector, then the total share of households achieving fully adequate housing will gradually increase.

### Addressing the Housing Needs of Low-Income Renters

Renters are often neglected by national housing policy initiatives, in part because expanding homeownership opportunities is so often seen as a primary policy objective. Inevitably, however, some households will continue to depend upon the rental market for housing, and in Ecuador, the conditions of the urban rental stock is quite poor.

Therefore, this policy scenario experiments with the provision of housing rehabilitation loans to the owners of rental housing in Quito and Guayaquil. Specifically, roughly half of the BEV Home Improvement Lending funds are reallocated from the owner-occupied sector to the rental sector. Loans are provided at the standard BEV interest rate to improve rental structures. We assume that landlords can only use these funds to make structural improvements, not improvements in infrastructure services. In addition, tenant rents are increased to cover the cost of rehabilitation loans.

Unfortunately, without deeper subsidies, a rental rehabilitation program of this nature cannot be expected to produce substantial improvements in housing quality. Landlords whose units are occupied by low income households cannot raise rents enough to cover the costs of the rehabilitation loans. And most of the units for which financing is feasible are already in adequate structural condition. Thus, only rental units occupied by households in the top two quintiles participate in the program, and the share of participating units that achieve full adequacy as a result of participation is low -- 9% in Quito and 18% in Guayaquil.

### Costs and Efficiency of Alternative Scenarios

Under the base case policy scenario, the total investment in housing over the 1988-1992 period would come to about s/. 129,667 million in Quito and s/. 159,849 million in Guayaquil. These totals do not change substantially under our alternative policy scenarios. The improved infrastructure service policy, which calls for substantial public sector grants to help cover the cost of extending water connections increases the total level of investment by about 0.4% in Quito and by 2% in Guayaquil. All of the policies combined produce only a 4.5% increase in total investment in Quito and a 3% increase in Guayaquil.

Total subsidy levels also do not vary dramatically across policy scenarios. Under the base case public sector subsidies (including effective interest rate subsidies) total s/.11,525 million in Quito and s/. 14,091 million in Guayaquil. These totals increase to s/.12,126 million in Quito and s/. 15,217 million in Guayaquil under the infrastructure policy. The other policies, however, do not increase subsidy costs at all.

All of the scenarios we simulated do, however, yield greater benefits at a given subsidy level than the base case. Because the infrastructure and titling policies elicit increased levels of savings/informal mobilization, and because the infrastructure policy enables such a large share of participating households to achieve fully adequate housing, the total effective subsidy costs per participant and per participant who achieves fully adequate housing are substantially reduced by these public sector initiatives.

### Efficiency of Policy Alternatives

(in Jan 1988 sucres 1,000s)

#### Quito

<u>Total Loans</u>	BASE	INFR	TITLE	S&Ls		
				A	B	APT
per particip	450	401	372	372	372	372
per achiever	5746	2646	1916	1916	1916	1871
<u>Effective Subsidy</u>						
per particip	184	169	157	157	157	157
per achiever	2355	1117	809	809	809	790

#### Guayaquil

<u>Total Loans</u>	BASE	INFR	S&Ls		
			A	B	APT
per particip	451	381	381	381	381
per achiever	2365	1454	1459	1461	1476
<u>Effective Subsidy</u>					
per particip	175	155	155	155	155
per achiever	918	591	593	594	600

In other words, by removing the key barriers to households' independent abilities to improve housing conditions, the infrastructure and titling programs substantially enhance the efficiency of all public sector lending programs.

### Impacts of Inflation on Policy Outcomes

Ecuador's inflation rate is a critical determinant of both the rate of improvement in housing conditions and the distribution of benefits from public policy interventions. Under all of the policy scenarios we have simulated, more households could achieve fully adequate housing if inflation was as low as 15%, than under current economic conditions. And if inflation increased to as high as 100%, even fewer households would be able to achieve fully adequate housing.

### Share of Households in Fully Adequate Housing with Piped Water

Low, Moderate, and High Inflation Assumptions

	Quito			Guayaquil		
	1992			1992		
	15%	50%	100%	15%	50%	100%
Base Case	48%	47%	47%	41%	42%	40%
Infrastructure	50	50	49	45	46	43
Title	52	51	50	--	--	--
Expanded S&Ls	53	52	51	45	46	43
Reformed S&Ls	52	52	51	45	46	43
Rental Rehab	53	52	51	45	46	43

In addition to reducing the share of households who can afford to achieve fully adequate housing conditions, high inflation and interest rates make conventional financing unaffordable for lower income households, so that the highest income households claim a larger and larger share of the available resources. As a result, the distribution of housing gains across income classes is affected by the inflation rate.

Specifically, the circumstances of the three middle income quintiles improve most rapidly when inflation is as low as 15%, and are virtually stalled under conditions of extremely high inflation (100%). The table below illustrates the impacts of inflation for different income quintiles under the base case policy scenario, presenting the change from 1987 to 1992 in the share of households living in fully adequate housing units with piped water, under our three alternative economic forecasts. Annex C provides complete results for all policy scenarios under the three inflation assumptions.

Share of Households by Quintile  
in Fully Adequate Housing with Piped Water

Base Case Policy Scenario  
Low, Moderate, and High Inflation Assumptions

Income	1987	Quito			Guayaquil			
		1992			1987	1992		
Quintile		15%	50%	100%		15%	50%	100%
1-low	17%	16%	16%	16%	12%	11%	11%	11%
2	25	31	29	27	18	25	23	21
3	50	49	48	47	36	39	43	33
4	71	68	66	66	55	54	53	53
5-high	81	74	76	78	81	77	79	83
Total	49	48	47	47	40	41	42	40

The housing circumstances of the lowest income quintile remain essentially unaffected by the inflation rate, primarily because this group cannot afford to participate in either the formal financial sector or in public sector lending programs, even when the inflation rate is as low as 15%. It is the households in the highest income quintile who appear to benefit most in periods of high inflation. In fact, the quality of this group's housing increases most quickly in the highest inflation simulation, and least quickly in the low inflation scenario.

This seemingly counterintuitive conclusion is a result of the competition for scarce formal financial resources between the top two, and sometimes three, income quintiles. In periods of low inflation, the cost of funds is lower, and thus formal finance is affordable to a greater number of households. As the cost of borrowing rises, fewer and fewer households can qualify for loans. This limits the number of households who are competing for funds, and allows a greater share of the available funds to flow to the highest income quintile, who consequently achieve rapid improvements in housing quality. These findings suggest that, if a lower rate of inflation was accompanied by an expanded pool of formal housing finance, all but the lowest 20% of the income distribution could achieve more substantial improvements in housing quality.

High inflation rates also greatly increase the subsidies required to operate the public sector lending programs as they are now structured. In simulating the impacts of alternative economic forecasts, we assumed that BEV and IESS continue to lend at 20% to 21% interest rates, even if inflation goes as high as 100%. Thus, when inflation is high, the implicit interest subsidies provided under these programs becomes considerably more expensive.

Effective Subsidy of Public Sector Lending Programs

Low, Moderate, and High Inflation Assumptions  
Effective Subsidy per Household Participating  
(in 1988 s./1,000s)

	Quito			Guayaquil		
	<u>Inflation</u>			<u>Inflation</u>		
	15%	50%	100%	15%	50%	100%
Base Case	18	184	199	18	175	178
Infrastructure	25	169	185	29	155	163
Title	23	157	174	--	--	--
Expanded S&Ls	23	157	199	29	155	163
Reformed S&Ls	23	157	174	29	155	163
Rental Rehab	23	157	169	29	155	163

Summary of Findings

The results of this initial series of policy simulations for Ecuador's two major cities yield the following basic conclusions:

The programs currently scheduled for implementation by BEV, IESS, and HG-007 are reasonably well targetted, and can be expected to produce small but significant gains among households in the second and third income quintiles.

However, if these programs alone are pursued for the next five years, the overall share of households living in fully adequate housing will drop in both Quito and Guayaquil.

The programs currently scheduled for implementation will fail to achieve progress in urban housing conditions because newly forming households in both Quito and Guayaquil are unable to afford serviced sites and because water connections are not being extended fast enough to occupied dwelling units.

The single most effective initiative we simulated is the program to reduce the cost of serviced land in Quito and Guayaquil and to substantially increase the rate at which water connections are extended to occupied dwellings.

This policy, in combination with the base case program, has the potential to increase the share of urban households who live in fully adequate housing in the short term.

In addition, once households have adequate infrastructure services, they can achieve incremental improvements in the structure quality over the long-term without further government assistance.

All of the policies simulated have difficulty reaching the lowest income quintile. Without much deeper subsidies, the poorest urban households either cannot afford to participate in most public programs, or are unable to achieve fully adequate housing conditions when they do participate.

Macro-economic conditions -- specifically, inflation and interest rates -- are just as instrumental in shaping housing outcomes as program designs. If inflation was as low as 15%, all of the programs we simulated would yield greater gains, especially for low and moderate income households.

Moreover, lower inflation rates would substantially reduce the government subsidies implicit in below-market interest rate lending.

**ANNEX A:****Base Year Classification Matrix -- Quito**

## QUINTILE 1 (LOW)

	Total	Full Doc	No Doc	Arrendada	Otra
Permanent Structures					
Acceptable Wate	17.0%	2.0%	0.0%	15.0%	0.0%
Unacceptable Wa	39.0%	2.0%	1.0%	30.0%	6.0%
Semi-Permanent Structures					
Acceptable Wate	6.5%	1.5%	0.0%	2.0%	3.0%
Unacceptable Wa	24.5%	2.5%	5.0%	12.5%	4.5%
Improvised Structures					
Acceptable Wate	2.5%	1.0%	0.0%	0.5%	1.0%
Unacceptable Wa	10.5%	1.0%	5.0%	2.0%	2.5%
Total Viviendas	100.0%	10.0%	11.0%	62.0%	17.0%
		10.0%	11.0%	62.0%	17.0%

## QUINTILE 2

	Total	Full Doc	No Doc	Arrendada	Otra
Permanent Structures					
Acceptable Wate	25.0%	5.0%	0.0%	20.0%	0.0%
Unacceptable Wa	37.0%	3.0%	3.0%	25.0%	6.0%
Semi-Permanent Structures					
Acceptable Wate	8.0%	3.0%	0.0%	5.0%	0.0%
Unacceptable Wa	22.0%	4.0%	4.0%	10.0%	4.0%
Improvised Structures					
Acceptable Wate	1.5%	0.0%	0.0%	1.0%	0.5%
Unacceptable Wa	6.5%	0.0%	3.0%	2.0%	1.5%
Total Viviendas	100.0%	15.0%	10.0%	63.0%	12.0%
		15.0%	10.0%	63.0%	12.0%

## QUINTILE 3

	Total	Full Doc	No Doc	Arrendada	Otra
Permanent Structures					
Acceptable Wate	50.0%	23.0%	1.0%	25.0%	1.0%
Unacceptable Wa	26.0%	1.5%	2.0%	20.0%	2.5%
Semi-Permanent Structures					
Acceptable Wate	2.5%	0.5%	1.0%	1.0%	0.0%
Unacceptable Wa	17.0%	0.0%	4.0%	10.0%	3.0%
Improvised Structures					
Acceptable Wate	1.0%	0.0%	0.0%	0.0%	1.0%
Unacceptable Wa	3.5%	0.0%	1.0%	0.0%	2.5%
Total Viviendas	100.0%	25.0%	9.0%	56.0%	10.0%
		25.0%	9.0%	56.0%	10.0%

## QUINTILE 4

	Total	Full Doc	No Doc	Arrendada	Otra
Permanent Structures					
Acceptable Wate	74.0%	40.0%	2.0%	30.0%	2.0%
Unacceptable Wa	17.5%	2.5%	2.0%	10.0%	3.0%
Semi-Permanent Structures					
Acceptable Wate	6.0%	2.5%	1.5%	2.0%	0.0%
Unacceptable Wa	2.5%	0.0%	0.5%	2.0%	0.0%
Improvised Structures					
Acceptable Wate	0.0%	0.0%	0.0%	0.0%	0.0%
Unacceptable Wa	0.0%	0.0%	0.0%	0.0%	0.0%
Total Viviendas	100.0%	45.0%	6.0%	44.0%	5.0%
		45.0%	6.0%	44.0%	5.0%

## QUINTILE 5 (HIGH)

	Total	Full Doc	No Doc	Arrendada	Otra
Permanent Structures					
Acceptable Wate	86.0%	55.0%	0.0%	30.0%	1.0%
Unacceptable Wa	10.0%	5.0%	0.0%	5.0%	0.0%
Semi-Permanent Structures					
Acceptable Wate	4.0%	0.0%	0.0%	3.0%	1.0%
Unacceptable Wa	0.0%	0.0%	0.0%	0.0%	0.0%
Improvised Structures					
Acceptable Wate	0.0%	0.0%	0.0%	0.0%	0.0%
Unacceptable Wa	0.0%	0.0%	0.0%	0.0%	0.0%
Total Viviendas	100.0%	60.0%	0.0%	38.0%	2.0%
		60.0%	0.0%	38.0%	2.0%

**ANNEX B:**  
**Base Year Classification Matrix -- Guayaquil**

## QUINTILE 1 (LOW)

	Total	Full Doc	No Doc	Arrendada	Otra
Permanent Structures					
Acceptable Wate	12.5%	0.5%	5.0%	5.5%	1.5%
Unacceptable Wa	27.5%	1.0%	12.0%	9.5%	5.0%
Semi-Permanent Structures					
Acceptable Wate	5.0%	0.0%	1.5%	2.5%	1.0%
Unacceptable Wa	29.5%	2.0%	14.0%	11.5%	2.0%
Improvised Structures					
Acceptable Wate	4.5%	0.0%	1.5%	2.0%	1.0%
Unacceptable Wa	21.0%	0.5%	9.0%	9.0%	2.5%
Total Viviendas	100.0%	10.0%	11.0%	62.0%	17.0%
		4.0%	43.0%	40.0%	13.0%

## QUINTILE 2

	Total	Full Doc	No Doc	Arrendada	Otra
Permanent Structures					
Acceptable Wate	15.5%	0.5%	6.0%	8.0%	1.0%
Unacceptable Wa	30.0%	1.0%	13.0%	14.0%	2.0%
Semi-Permanent Structures					
Acceptable Wate	9.0%	1.0%	3.0%	3.0%	2.0%
Unacceptable Wa	23.5%	1.5%	9.5%	11.0%	1.5%
Improvised Structures					
Acceptable Wate	5.5%	0.0%	2.0%	3.0%	0.5%
Unacceptable Wa	16.5%	0.5%	6.0%	8.0%	2.0%
Total Viviendas	100.0%	15.0%	10.0%	63.0%	12.0%
		4.5%	39.5%	47.0%	9.0%

## QUINTILE 3

	Total	Full Doc	No Doc	Arrendada	Otra
Permanent Structures					
Acceptable Wate	30.0%	4.0%	7.5%	17.0%	1.5%
Unacceptable Wa	30.5%	3.0%	7.5%	17.0%	3.0%
Semi-Permanent Structures					
Acceptable Wate	6.0%	0.0%	2.0%	4.0%	0.0%
Unacceptable Wa	18.5%	3.0%	7.0%	8.0%	0.5%
Improvised Structures					
Acceptable Wate	4.0%	0.5%	1.0%	2.0%	0.5%
Unacceptable Wa	11.0%	1.0%	3.0%	6.0%	1.0%
Total Viviendas	100.0%	25.0%	9.0%	56.0%	10.0%
		11.5%	28.0%	54.0%	6.5%

## QUINTILE 4

	Total	Full Doc	No Doc	Arrendada	Otra
Permanent Structures					
Acceptable Wate	52.0%	17.0%	7.0%	25.0%	3.0%
Unacceptable Wa	23.5%	5.0%	3.5%	14.0%	1.0%
Semi-Permanent Structures					
Acceptable Wate	12.0%	6.0%	2.0%	4.0%	0.0%
Unacceptable Wa	5.0%	1.0%	2.0%	2.0%	0.0%
Improvised Structures					
Acceptable Wate	6.0%	1.0%	1.0%	3.0%	1.0%
Unacceptable Wa	1.5%	0.0%	0.0%	1.0%	0.5%
Total Viviendas	100.0%	45.0%	6.0%	44.0%	5.0%
		30.0%	15.5%	49.0%	5.5%

## QUINTILE 5 (HIGH)

	Total	Full Doc	No Doc	Arrendada	Otra
Permanent Structures					
Acceptable Wate	83.0%	44.0%	2.0%	35.5%	1.5%
Unacceptable Wa	11.5%	5.5%	0.5%	5.0%	0.5%
Semi-Permanent Structures					
Acceptable Wate	5.5%	3.0%	0.5%	2.0%	0.0%
Unacceptable Wa	0.0%	0.0%	0.0%	0.0%	0.0%
Improvised Structures					
Acceptable Wate	0.0%	0.0%	0.0%	0.0%	0.0%
Unacceptable Wa	0.0%	0.0%	0.0%	0.0%	0.0%
Total Viviendas	100.0%	60.0%	0.0%	38.0%	2.0%
		52.5%	3.0%	42.5%	2.0%

**ANNEX C:**  
**Complete Policy Simulation Results**

## 50% INFLATION

## POLICY SIMULATION RESULTS

Share of Households in Fully Adequate Units with Piped Water

	Quito							Guayaquil						
	1987	1992	1992	1992	1992	1992	1992	1987	1992	1992	1992	1992	1992	
	BASE	INFR	TITLE	S&Ls	SL-B	APT		BASE	INFR	S&Ls	SL-B	APT		
Q1	17%	16%	17%	17%	17%	17%		12%	11%	13%	13%	13%	13%	
Q2	25	29	30	33	33	32		18	23	26	26	26	25	
Q3	50	48	50	51	51	51		36	43	44	44	44	44	
Q4	71	66	73	73	74	76		55	53	61	62	63	64	
Q5	81	76	79	81	83	83		81	79	83	86	81	81	
Total	49	47	50	51	52	52	40	42	46	46	46	46	46	

Share of Households with Piped Water

	Quito							Guayaquil						
	1987	1992	1992	1992	1992	1992	1992	1987	1992	1992	1992	1992	1992	
	BASE	INFR	TITLE	S&Ls	SL-B	APT		BASE	INFR	S&Ls	SL-B	APT		
Q1	25%	25%	28%	28%	28%	28%	21%	20%	25%	25%	25%	25%	25%	
Q2	34	35	38	40	40	40	30	31	37	37	37	37	37	
Q3	52	50	52	54	54	54	42	49	50	50	50	50	50	
Q4	75	68	75	75	76	78	64	60	68	69	70	70	70	
Q5	85	79	83	85	87	86	85	82	87	90	85	85	85	
Total	54	51	55	56	57	57	48	48	53	54	54	54	54	

Share of Households with Adequate Dwellings

	Quito							Guayaquil						
	1987	1992	1992	1992	1992	1992	1992	1987	1992	1992	1992	1992	1992	
	BASE	INFR	TITLE	S&Ls	SL-B	APT		BASE	INFR	S&Ls	SL-B	APT		
Q1	55%	55%	55%	55%	55%	55%	38%	35%	35%	35%	35%	35%	35%	
Q2	56	60	60	60	60	60	46	48	48	48	48	48	47	
Q3	78	75	76	76	76	76	71	76	76	76	76	76	76	
Q4	90	84	87	87	88	90	82	79	83	84	85	85	86	
Q5	96	96	96	96	96	96	95	97	96	96	96	96	96	
Total	74	74	75	75	75	75	66	67	68	68	68	68	68	

Share of Households who Own without Full Legal Documentation

	Quito							Guayaquil					
	1987	1992	1992	1992	1992	1992	1992	1987	1992	1992	1992	1992	1992
	BASE	INFR	TITLE	S&Ls	SL-B	APT		BASE	INFR	S&Ls	SL-B	APT	
Q1	12%	14%	14%	8%	8%	8%		43%	44%	44%	44%	44%	44%
Q2	11	13	13	7	7	7		36	32	32	32	32	34
Q3	10	11	11	6	6	6		24	23	22	22	22	24
Q4	7	7	7	3	3	3		16	15	15	15	15	15
Q5	0	0	0	0	0	0		3	3	3	3	3	3
Total	8	9	9	5	5	5		24	23	23	23	23	24

Recipients of Base Case Policy Assistance

1988-1992

	Quito		Guayaquil	
	Participants	Achieving Acceptable Housing	Participants	Achieving Acceptable Housing
Q1	0	0	4259 (15%)	0
Q2	10996 (18%)	2909 (26%)	12373 (15%)	4971 (40%)
Q3	30064 (48%)	1111 (4%)	37810 (47%)	7480 (5%)
Q4	12132 (19%)	872 (7%)	13154 (16%)	2076 (16%)
Q5	9355 (15%)	1724 (18%)	12870 (16%)	823 (6%)
Tot	62547 (100%)	6616 (11%)	80466 (100%)	15350 (19%)

Recipients of Infrastructure Expansion

1988-1992

<u>Quito</u>			<u>Guayaquil</u>		
Participants	Achieving Acceptable Housing		Participants	Achieving Acceptable Housing	
Q1	1983 (22%)	360 (18%)	4026 (24%)	1480 (37%)	
Q2	1815 (20%)	468 (24%)	3815 (22%)	1559 (41%)	
Q3	1333 (15%)	1095 (82%)	2892 (17%)	1989 (69%)	
Q4	1958 (22%)	1958 (100%)	3506 (21%)	3506 (100%)	
Q5	1981 (22%)	1981 (100%)	2762 (16%)	2762 (100%)	
Tot	9070 (100%)	5866 (65%)	17001 (100%)	11296 (66%)	

Recipients of Legal Tenure Assistance

1988-1992

<u>Quito</u>			<u>Guayaquil</u>		
Participants	Achieving Acceptable Housing		Participants	Achieving Acceptable Housing	
Q1	1449 (29%)	0			
Q2	1449 (29%)	0			
Q3	899 (18%)	0			
Q4	1201 (24%)	193 (16%)			
Q5	0	0			
Tot	4998 (100%)	193 (4%)			

Efficiency of Policy Alternatives  
(in Jan 1988 sucres 1,000s)

Quito

Guayaquil

Total Loans	Quito						Guayaquil					
	BASE	INFR	TITLE	S&Ls	SL-B	APT	BASE	INFR	S&Ls	SL-B	APT	
per hh served	450	401	372	372	372	372	451	381	381	381	381	
per hh shifting	5746	2646	1916	1916	1916	1871	2365	1454	1459	1461	1476	
Effective Subsidy												
per hh served	184	169	157	157	157	157	175	155	155	155	155	
per hh shifting	2355	1117	809	809	809	790	918	591	593	594	600	

## 100% INFLATION

## POLICY SIMULATION RESULTS

Share of Households in Fully Adequate Units with Piped Water

	Quito							Guayaquil					
	1987	1992 BASE	1992 INFR	1992 TITLE	1992 S&Ls	1992 SL-B	1992 APT	1987	1992 BASE	1992 INFR	1992 S&Ls	1992 SL-B	1992 APT
Q1	17%	16%	17%	17%	17%	17%	17%	12%	11%	13%	13%	13%	13%
Q2	25	27	28	31	31	31	32	18	21	22	23	23	21
Q3	50	47	49	51	51	51	51	36	33	38	38	38	38
Q4	71	66	69	70	70	70	70	55	53	57	57	57	58
Q5	81	78	81	84	86	85	86	81	83	87	86	84	85
Total	49	47	49	50	51	51	51	40	40	43	43	43	43

Share of Households with Piped Water

	Quito							Guayaquil					
	1987	1992 BASE	1992 INFR	1992 TITLE	1992 S&Ls	1992 SL-B	1992 APT	1987	1992 BASE	1992 INFR	1992 S&Ls	1992 SL-B	1992 APT
Q1	25%	25%	28%	28%	28%	28%	28%	21%	20%	25%	25%	25%	25%
Q2	34	33	36	39	39	39	39	30	27	33	33	33	33
Q3	52	40	51	53	53	53	53	42	39	43	43	43	43
Q4	75	68	71	72	72	72	72	64	60	64	64	64	64
Q5	85	82	85	88	90	89	89	85	86	90	90	90	88
Total	54	51	54	56	56	56	56	48	47	51	51	51	51

Share of Households with Adequate Dwellings

	Quito							Guayaquil					
	1987	1992 BASE	1992 INFR	1992 TITLE	1992 S&Ls	1992 SL-B	1992 APT	1987	1992 BASE	1992 INFR	1992 S&Ls	1992 SL-B	1992 APT
Q1	55%	55%	55%	55%	55%	55%	55%	38%	35%	35%	35%	35%	35%
Q2	56	55	55	56	56	56	57	46	46	46	47	47	45
Q3	78	75	76	76	76	76	76	71	73	74	74	74	74
Q4	90	84	84	84	84	84	84	82	79	79	79	79	80
Q5	96	96	96	96	96	96	97	95	97	97	96	96	96
Total	74	73	73	73	73	73	74	66	66	66	66	66	66

Share of Households who Own without Full Legal Documentation

	Quito							Guayaquil					
	1987	1992 BASE	1992 INFR	1992 TITLE	1992 S&Ls	1992 SL-B	1992 APT	1987	1992 BASE	1992 INFR	1992 S&Ls	1992 SL-B	1992 APT
Q1	12%	14%	14%	8%	8%	8%	8%	43%	44%	44%	44%	44%	44%
Q2	11	13	13	7	7	7	7	36	32	32	32	32	34
Q3	10	11	11	6	6	6	6	24	24	23	22	22	24
Q4	7	7	7	4	4	4	4	16	15	15	15	15	15
Q5	0	0	0	0	0	0	0	3	3	3	3	3	3
Total	8	9	9	5	5	5	5	24	23	23	23	23	24

Recipients of Base Case Policy Assistance

1988-1992

	Quito		Guayaquil	
	Participants	Achieving Acceptable Housing	Participants	Achieving Acceptable Housing
Q1	0 ( 0%)	0 ( 0%)	7331 ( 7%)	0 ( 0%)
Q2	16205 (20%)	1551 (10%)	19997 (18%)	2855 (14%)
Q3	43419 (53%)	209 ( 0.5%)	57458 (52%)	315 ( 0.5%)
Q4	12136 (15%)	865 ( 7%)	13151 (12%)	2063 (16%)
Q5	9358 (12%)	0 ( 0%)	12870 (12%)	823 ( 6%)
Tot	81118(100%)	2625 ( 3%)	110807(100%)	6056 ( 5%)

Recipients of Infrastructure Expansion

1988-1992

	Quito		Guayaquil	
	Participants	Achieving Acceptable Housing	Participants	Achieving Acceptable Housing
Q1	1885 (21%)	342 (18%)	3842 (23%)	1412 (37%)
Q2	1883 (21%)	446 (24%)	3842 (23%)	1519 (40%)
Q3	1669 (18%)	1446 (87%)	3836 (23%)	2812 (73%)
Q4	1751 (19%)	1751(100%)	2842 (17%)	2842(100%)
Q5	1883 (21%)	1751(100%)	2636 (16%)	2636(100%)
Tot	9071(100%)	5868 (65%)	16998(100%)	11221 (66%)

Recipients of Legal Tenure Assistance

1988-1992

<u>Quito</u>			<u>Guayaquil</u>		
Participants		Achieving Acceptable Housing	Participants		Achieving Acceptable Housing
Q1	1401 (28%)	0			
Q2	1401 (28%)	0			
Q3	1068 (21%)	0			
Q4	1128 (23%)	315 (14%)			
Q5	0	0			
Tot	4998(100%)	153 ( 3%)			

Efficiency of Policy Alternatives  
(in Jan 1988 sucres 1,000s)

	<u>Quito</u>						<u>Guayaquil</u>					
	BASE	INFR	TITLE	S&Ls	SL-B	APT	BASE	INFR	S&Ls	SL-B	APT	
Total Loans												
per hh served	347	318	299	343	299	291	328	293	293	293	293	
per hh shifting	10713	3242	2193	2193	2193	1995	9955	2110	2166	2166	2192	
Effective Subsidy												
per hh served	199	185	174	199	174	169	178	163	163	163	163	
per hh shifting	6142	1887	1277	1277	1277	1161	3255	1175	1205	1205	1220	

## 15% INFLATION

## POLICY SIMULATION RESULTS

Share of Households in Fully Adequate Units with Piped Water

	Quito							Guayaquil					
	1987	1992	1992	1992	1992	1992	1992	1987	1992	1992	1992	1992	1992
	BASE	INFR	TITLE	S&Ls	SL-B	APT		BASE	INFR	S&Ls	SL-B	APT	
Q1	17%	16%	17%	17%	17%	17%	12%	11%	13%	13%	13%	13%	13%
Q2	25	31	33	37	37	37	18	25	28	28	28	28	27
Q3	50	49	51	55	55	60	36	39	42	42	42	42	42
Q4	71	68	71	72	73	73	55	54	59	60	61	62	62
Q5	81	74	77	79	80	80	81	77	81	81	80	80	80
Total	49	48	50	52	53	52	40	41	45	45	45	45	45

Share of Households with Piped Water

	Quito							Guayaquil					
	1987	1992	1992	1992	1992	1992	1992	1987	1992	1992	1992	1992	1992
	BASE	INFR	TITLE	S&Ls	SL-B	APT		BASE	INFR	S&Ls	SL-B	APT	
Q1	25%	25%	28%	28%	28%	28%	21%	19%	25%	25%	25%	25%	25%
Q2	34	37	40	44	44	44	30	32	37	37	37	37	37
Q3	52	51	53	57	57	62	60	42	43	47	47	48	47
Q4	75	69	73	74	74	75	75	64	61	67	67	68	68
Q5	85	78	81	83	84	84	84	85	80	84	85	84	84
Total	54	52	55	57	58	59	58	48	47	52	52	52	52

Share of Households with Adequate Dwellings

	Quito							Guayaquil					
	1987	1992	1992	1992	1992	1992	1992	1987	1992	1992	1992	1992	1992
	BASE	INFR	TITLE	S&Ls	SL-B	APT		BASE	INFR	S&Ls	SL-B	APT	
Q1	55%	55%	55%	55%	55%	55%	38%	35%	35%	35%	35%	35%	35%
Q2	56	56	58	61	61	61	46	49	50	50	50	49	49
Q3	78	76	77	77	77	81	81	71	75	76	76	76	76
Q4	90	85	85	86	86	87	87	82	79	82	82	83	84
Q5	96	96	96	96	96	96	97	95	97	97	96	96	96
Total	74	74	74	75	75	76	76	66	67	68	68	68	68

Share of Households who Own without Full Legal Documentation

	Quito							Guayaquil					
	1987	1992	1992	1992	1992	1992	1992	1987	1992	1992	1992	1992	1992
	BASE	INFR	TITLE	S&Ls	SL-B	APT		BASE	INFR	S&Ls	SL-B	APT	
Q1	12%	14%	14%	8%	8%	8%		43%	44%	44%	44%	44%	44%
Q2	11	13	13	7	7	7		36	32	32	32	32	35
Q3	10	11	11	4	4	4		24	24	22	22	22	24
Q4	7	7	7	3	3	3		16	15	15	15	15	15
Q5	0	0	0	0	0	0		3	3	3	3	3	3
Total	8	9	9	4	4	4		24	23	23	23	23	24

Recipients of Base Case Policy Assistance

1988-1992

<u>Quito</u>				<u>Guayaquil</u>			
Participants		Achieving Accep- table Housing		Participants		Achieving Accep- table Housing	
Q1	0 ( 0%)		0 ( 0%)	346 ( 1%)		64 (18%)	
Q2	8232 (16%)		3660 (44%)	10227 (17%)		6169 (60%)	
Q3	20254 (41%)		1825 ( 9%)	22384 (38%)		3990 (18%)	
Q4	12114 (24%)		871 ( 7%)	13118 (22%)		2059 (16%)	
Q5	9355 (19%)		0 ( 0%)	12870 (22%)		823 ( 6%)	
Tot	49955(100%)		6356 (13%)	58945(100%)		13105 (22%)	

Recipients of Infrastructure Expansion

1988-1992

<u>Quito</u>				<u>Guayaquil</u>			
Participants		Achieving Accep- table Housing		Participants		Achieving Accep- table Housing	
Q1	1923 (21%)		349 (18%)	3819 (22%)		1404 (37%)	
Q2	1922 (21%)		1317 (69%)	3819 (22%)		2449 (64%)	
Q3	1401 (15%)		1173 (84%)	3351 (20%)		2331 (70%)	
Q4	1902 (21%)		1902(100%)	3394 (20%)		3394(100%)	
Q5	1922 (21%)		1922(100%)	2619 (15%)		2619(100%)	
Tot	9070(100%)		6663 (73%)	17002(100%)		12197 (72%)	

Recipients of Legal Tenure Assistance

1988-1992

<u>Quito</u>			<u>Guayaquil</u>		
	Participants	Achieving Accep- table Housing		Participants	Achieving Accep- table Housing
Q1	1449 (29%)	0			
Q2	1449 (29%)	0			
Q3	899 (18%)	0			
Q4	1201 (24%)	193 (16%)			
Q5	0	0			
Tot	4998(100%)	193 ( 4%)			

Efficiency of Policy Alternatives  
(in Jan 1988 sucres 1,000s)

	<u>Quito</u>						<u>Guayaquil</u>				
	BASE	INFR	TITLE	S&Ls	SL-B	APT	BASE	INFR	S&Ls	SL-B	APT
Total Loans											
per hh served	563	487	445	445	445	445	616	493	493	493	493
per hh shifting	4425	2184	1415	1415	1415	1459	2771	1460	1493	1490	1503
Effective Subsidy											
per hh served	18	25	23	23	23	23	18	29	29	29	29
per hh shifting	140	113	73	73	73	76	83	86	88	88	89