unresponsive to the changing needs of the poor and inhibits their socio-economic development, upward mobility, the investment of their savings and their skills and initiative.

Turner consistently stresses the need of the inhabitants of spontaneous settlements for security of land-tenure. This is their most fundamental requirement; and he links aspirations to land-tenure with what he has called the 'creative' nature of home building, the need for an 'anchor of hope' and 'the stimulation of social development through the cultivation and strengthening of the family'. Spontaneous settlements represent a solution rather than a problem; they represent a solution to the housing problem of the low-income groups of the cities of the developing countries as conceptualized by the urban poor themselves.

The fostering of spontaneous settlement will, inevitably imply in a majority of cases a widely spread city of relatively low density with such settlements on the periphery. While this may have merit as a solution to the housing problem in certain circumstances, inherent difficulties of transport services, of the extension of roads, water supply, lighting and sewerage, of industrial location and of the journey to work must be recognized.

At a micro-level, one of the most critical difficulties lies in the poor design and layout both of the individual dwelling and of the community as a whole when constructed almost wholly by unskilled and often ignorant workers who, if not direct migrants, may be only a few years removed from rural hinterlands. At the level of the individual dwelling there is usually a marked tendency to produce already known but basically unsatisfactory forms, either those of the houses of the poor in the countryside or those of the urban slum near the city center.

Surveys of barriadas (pueblos jóvenes) in 1970 showed that the inhabitants had an intense feeling of concern not only with the lack of property title, but also the location of medical services. Among the physical facilities, the unpaved condition of streets, presumably because of the dust problem caused by Lima's dry climate; and the absence of water and sewerage services rank high as sources of dissatisfaction. Education was considered satisfactory.

The provision of technical aid for house construction ranked low in the survey. There was also very little interest in obtaining credit for house building through institutional channels, siting there was a reluctance to assume any continuing financial burden. Also, most families prefer to add to their houses piecemeal as and when money and time became available.

PREVI Project - The United Nations Development Program Special Fund, started the Proyecto Experimental de Vivienda (PREVI) in July 1968

using a mixed team of local and United Nations personnel. The overall objective was to develop new methods and techniques for application on a significant scale as part of Peru's housing policy. So far these new approaches have been sought through three pilot projects: in low-cost housing design; the improvement of inner urban areas; and planning for rational establishment and growth of new spontaneous settlements. Activities in the field of low cost housing design have proved controversial, especially in so far as they centered around an international competition held by PREVI in 1969 for the design of 1,500 dwellings, which was opened to Peruvian architects and to thirteen invited foreign architects.

This expensive competition was clearly not aimed at solving the problem of mass housing which concerns the poor, for the design specification requirements were better suited for lower white-collar workers seeking regular housing than for the inhabitants of Lima's pueblos jóvenes.

It has since been decided to build groups of pilot houses in various parts of the project area, using a large number of the designs submitted, not merely those of the competition winners. Criticism of these activities has grown considerably in Lima, especially at the lack of practical results that can be applied on a significant scale to current projects. PREVI's activities in the field of low-cost housing design seem to violate what should be a basic premise for action-oriented research in the field of technological development for Third World housing; that it is almost never possible to justify expensive investigations that are not directly oriented to building cities for the poor, cities planned around the basic housing and other environmental needs of the mass of the people.

NOTES FILM TITLE: ESPACIO VITAL

Catholic University Film about Pueblos Jovenes
provided by HKaufman, Family Health Officer, AID/P
Gersony & Lynch

1. Purpose In order to understand the background of the pueblos jovenes, the Family Health Officer arranged for a screening of this film, recently purchased by AID/P.

2. The film described a particular land invasion which led to the settlement of a pueblo joven in the Canto Grande area, one of the areas which we will be looking at in the field.

3. The invasion began on February 19, 1976, when a group of families invaded public lands near the Huascar Bridge, outside of Lima. The families were mainly renters (48%) and lodgers (52%) who lived in inner City slums.

For about four days the families lived in shelters which they constructed for themselves at the initial invasion site. During this time, additional families arrived.

The shelters which they constructed consisted of wood (2X2?) poles covered with fairly thick plastic (table-cloth type?) sheeting, with a combination of cardboard and plastic sheeting for roofing.

4. On February 23, 1976, the Government moved the invaders to a cleared site in Canto Grande, about 45 minutes from the center of Lima. The site had no services: it consisted of an open, flat area with plots of varying sizes (90, 120, 140 square meters) delineated with paint on the ground.

Sites were distributed to the families through a lottery: the size and location of the individual lot was a question of chance. People brought with them the shelter materials they had used at the initial site, plus some hardboard or plywood sheets, petates (esteras), mattresses, and other belongings.

One family showed how they had built their own simple latrine in 12 hours: basically a hole in the ground about 2.5 - 3 feet in diameter, reportedly more than 2 meters deep, covered by a wooden pallet. Their shelters were built again of the same materials used in the temporary site, but seemed to incorporate some of the other materials as well.

("...documentos en la mano y abiertos..." one person
kept yelling during the lottery)

Water for the site was provided by private tank trucks, at that time charging S/10 per liter for fresh water, S/8 per liter for salt water. There were complaints that he didn't deliver much water to that area - he went to another area where people paid more for the water (PJ water rates are 15 times those of downtown areas).

Apparently very quickly after the new site was occupied, a store sprang up with basic foods and supplies - seemed well stocked.

5. By July, 1978, the same site appeared to be vastly better developed, at least in terms of quality of housing, thermal materials, etc. There seemed to be a lot of building with brick (some adobe?), but with concrete roofs. It seems unlikely that the roofs are stable. Could be a major source of injuries in an EQ 10PM - 6AM.

6. People seemed happy with their little plot of land. They had been paying S/700 a month rent before. The layout of the area was simple but adequate. There didn't seem to be much expectation for a lot of Government services. What is the applicability of this to emergencies (just life compressed by a factor of a thousand, anyhow)? Could a system be mobilized to get people onto their own land, even if somewhat remote, for 100,000 families in a few weeks? Somebody around here seems to know how to do it: can the ability be multiplied? land made available?

Note: This film is in the film library of USAID's Urban Development Division. Contact Person: Ing. Rodolfo Salinas

August 22, 1981

NOTES

Analysis of the Potential for Housing Improvement in High Risk, Vulnerable Areas of Peru, Frederick C. Cuny, INTERTECT, April, 1979 (developed under an AID Grant)

This booklet is a useful general overview of the potential for upgrading the seismic-resistance of housing in Peru; its conclusions seem pessimstic: this area is not a priority within governmental or non-governmental organizations, and the probability that activities designed to meet this need will be carried out is low. However, the technology for such improvement exists or is in advanced stages of development and some small-scale projects with limited objectives could probably be carried out.

A strong feature of the booklet is its overview of Governmental and non-Governmental agencies in relation to this theme: each major agency with an existing or potential role for participation in housing disaster mitigation programs is described and its activities reviewed in general terms. It is a good introduction to the field.

Two items of interest to a Lima plan:

- The Ministerio de Vivienda estimated in 1979 that about three million people -- (60% of the population?) of Lima live in non-engineered structures that do not meet basic seismic-resistant guidelines. Spiraling costs are a main constraint for low-income families who might wish to incorporate seismic-resistant features in their buildings; the prices of lightweight roofing materials, cement, wire and, in many cases rock and gravel, combined with increased interest rates (in even the small number of cases where loans are available) make disaster mitigation activities very difficult.

- Under a section entitled "The Bureaucracy" Cuny comments:

  > Even emergency programs (which in other countries can be developed and approved often in a matter of days following a disaster) have never gotten beyond the talking stage in Peru, due to the long bureaucratic process necessary to delegate funds. Unless a foreign agency is willing to put up the money and, in many cases, to staff the emergency program, small-scale disasters generally receive no more than a superficial site visit by the appropriate agency.

The paper contains some excellent graphic materials:

- Figure 1: A map of Peru graphically demonstrating the various types of housing built in different regions of Peru

- Figure 2: A simple presentation of plate tectonics of Peru, including (A) Principal Fault, and (B) Schematic of the Subduction Zone near Peru

- Figure 3: An 8-1/2 X 11 reproduction of a map showing seismic activity in Peru, including relative depth, pre- and post-1913.

- Figure 4: An 8-1/2 X 11 reproduction of a map showing Energía Liberada por Sismos Mas Superficiales que 400 Kilómetros

(Both Figures 3 and 4 are produced by the National Planning Institute Geographical Advisory Group)

- Figure 5: A map produced by INTERTECT dividing Peru into three zones, according to relative degrees of seismicity (Lima falls into Zona I).

Latin America: Housing Survey for Disaster Relief and Preparedness, OFDA, March, 1981; Peru Section (pages 94-105)

1. Average Number of People per Household: 5.1

2. The report summarizes the findings of the Thompson/OAS and INTERTECT reports on housing solutions after the 1970 earthquake:

(a) 500 Igloos supplied by the German Red Cross were still being used in 1976 but the people did not like them at all.

(b) Some barracks-style buildings (multi-family units) with corrugated cement/asbestos roofing were built but not appreciated. The communal living arrangement, dirt floors, and lack of windows have been cited as reasons for their generally negative reception. Their construction period (3-6 months) made them inappropriate as disaster solutions. The plan to reuse the materials in permanent structures was unfeasible. AID paid for about 600/700 of these units.

(c) Zinc sheets provided by OAS were not helpful because of their thermal characteristics.

(d) Tents provided by the USG "were still in use long after the initial emergency period. They could not provide adequate shelter in the disaster areas.

3. After the 1974 earthquake near Lima, USG financed the purchase of esteras (woven cane mats) to be used as shelters. They worked out OK but supply lines were all tied up because of the small number of producers.

Comment: This was a good option, but the problem was predictable. Let's find someone who worked on this, maybe in Ministerio de la Vivienda.

4. The report refers to an unannotated report that 75% of the population of Lima live in pueblos jovenes or in tugurios.

5. The report asserts that progressive improvement of living conditions and services have characterized the development of the pueblos joevens, as opposed to the tugurios. 71% of urban housing have permanent roofs (of which 25% are made of concrete).

6. Most of the information is drawn from the AID housing sector survey, or from the INTERTECT or Thompson reports mentioned above. Two points of interest:

(a) When the pueblos joevens began their development (which is the same situation as after an earthquake in some respects), what materials did they use. Apparently, given the incentive of their own lot, these materials were considered by them to be adequate.

(b) One of the biggest problems after the 1970 earthquake seems to have been the long-drawn out, confused planning process which followed as GOPattempted to guide rather specifically the reconstruction process. A major lesson was learned here, but what was it?

Estudio Sismico de las Viviendas en el Distrito de La Victoria

from Thesis by Jose L Medina Avila, 1977

Pozos tubular con equipo - ⊕ (WELLS)

ref. no.	approx address
2	980 Av. Canada
4	449 Av. Palermo
5	1180 Av. Canada
7	Kodak Peruano, Av. Alejandro Bussalleu, (near 501 bloc of Av. N. Arriola)

Pozos tubular sin equipo - O

5	Ministerio de Energia y Minas Compound

N.B. The water table for this District is found to be between 70 & 120 ft.

Housing types

Type A 75% adobe, ladrillo (highly vulnerable)
Type B 50% well preserved adobe, unreinforced brick

For El Distrito de La Victoria

Type A 41-60% found within the following quadrant
east boundary - Av. San Pablo
south boundary - Jiron Hipolito Unaue
west boundary - Jiron Abtao
north boundary - District border

Type B 41-60% found within the following quadrant
everything except for the eastern quadrant separated by the Av. Mexico & Av. Aviacion

The most vulnerable area in Distrito de La Vicotia appears to be the mid-northern section, most of the rest of the district is only moderately vulnerable (this is in relation to the type of construction that the residents are living) However, the most concentrated number of people appear to occupy the area north of Av. Mexico.

R. Lynch
28/7

September 7, 1981

EXTRACT

Mensaje al Congreso (STATE OF THE ECONOMY ADDRESS), Prime Minister Ulloa, August 27, 1980

There were a few points in this 50-page single-spaced speech which are of some interest to our project:

1. The housing deficit is estimated at one million units, of which 40% are in Lima. Thus, 51% of Peru's urban population live in conditions described as "tugurios desprovistos de las más elementales condiciones" as far as health, water and sewerage is concerned.

From 1968 to 1980, he reports, only 11,781 houses were constructed (assume he means by the State).

2. Of a population of 18 million persons, only 5-1/2 million can be classified as "economically active". Unemployment is 7%, but underemployment affects 52% of the population. Only 40% of the work force has stable employment and receives a salary equal to or greater than the minimum wage.

3. In the decade of the 1970's, the cooperative movement was distorted for political purposes by SINAMOS.

4. 50% of the annuel budget is dedicated to serving the debt and military spending.

5. Cooperatives On page 22 of the address, numerous comments are made concerning the cooperative movement. The policy of support for cooperatives is traced back to those of the democratic governments of 1963 - 1968. The Government "supports the objectives of developing the cooperative movement in all of its aspects" and particularly:

- Promotion and protection of cooperativism, and efficient system for the development of the national economy, strengthening democracy, and insuring social justice;

- State guaranteed right of cooperatives for its free development, and the autonomy of cooperative organizations;

- Re-establishment of the Instituto Nacional de Cooperativas, "con facultades y atribuciones más amplias";

- Encouragement of cooperative integration through tax incentives;

- Special emphasis on the Financial Integration of the Peruvian Cooperative Movement, including the Banco Nacional de Cooperativas.

- Perfecting (refining) the General Cooperative Laws, in accordance with suggestions of the national cooperative movement.

6. Housing A methodology for housing development includes utilization of "la capacidad de ahorro e iniciativa de la población encausándola al mejoramiento de sus instalaciones habitacionales implementando el Banco de Materiales."

Also, "el oportuno abatecimiento de materiales de construcción."

7. Electricity

Two essential projects are described for electricity:

The thermal plant for Lima, in which the World Bank has apparently expressed agreement, in principle, for financing of US$180 million.

Construction of a third major line from the Río Montaro hydroelectric plant to Lima, which could be a reality in three years if the programs is completed on time.

Comments

This STATE OF THE ECONOMY address obviously is not directly related to an emergency plan for Lima. But the emphasis on cooperatives, and the Government's strong support for an autonomous cooperative movement, are interesting and important in connection with the Government's reaction to cooperatives as a post-disaster distribution mechanism.

The mention of the Banco de Materiales is important, and might provide a good idea fo an implementing agency which could be considered.

The concept of the "housing" and "services" deficits will definitely come into discussions on post-disaster housing policy. Also, the number of houses built by the State appears to be an issue which is broached -- it could disappear as easily.

As one of our past approaches has addressed under- and un-employment rather effectively, this might be received sympathetically.

Gersony

July 16, 1981

NOTES

Extracted from:

Protección de Lima Metropolitana Ante Sismos Destructivos
Ing. Julio Kuroiwa H., Profesor Principal, Universidad Nacional de Ingeniería, y Miembro del Comité de Asesoramiento Científico del Comité Nacional de Defense Civil. (Published in 1977, a tribute to the 100th Anniversary of the University)

These notes don't attempt to serve as an ABSTRACT; I have noted only items which are of particular interest to the work we are undertaking.

1. The general purpose of the study is to determine the impact of the most probable destructive earthquake in Metropolitan Lima. This emphasis is justified because 25% of the population resides in this area and where 70% of Peru's economic activity is based.

Comment: This is an interesting justification - because that means that the other 75% of the population develops only 25% of the economic activity.

2. The most vulnerable zones of the parts of the City which were studied are:

Barrios Altos	Cercado
Rímac (Parts)	Barranco
Callao	Chorrillos

Their vulnerability is based on density of population, and use of construction materials (adobe and quincha) which have been severely weakened by humidity and time.

3. The least vulnerable of the areas studied are:

San Borja	Chacarilla del Estanque
Corpac	

4. In terms of risk to the water system, the three areas of danger are:

- Unfavorable soil
- Soils of mixed quality
- Old tubing

5. Japan is spending more than S/75,000,000,000 (=US$340,million?) per year on earthquake preparedness in Tokyo.

6. In general, the study concludes that adobe structures are the most vulnerable but that brick buildings are not being built, except in a few cases, to seismic resistant specifications.

7. The study (presented in about 136 pages, double-spaced) required four years in preparation and is described by the author as a mere outline of the problem.

8. On October 3, 1974, Lima suffered an earthquake of a grade estimated at between VI and VII MM. A visiting Japanese expert, Professor Hajime Unemura of the University of Tokyo, estimated that if the intensity of the earthquake had been slightly higher, it would have resulted in a "true catastrophe".

This study takes as a base the same hypothesis: an earthquake just slightly more intense than that of October 3, 1974, and comes to the independent conclusion that Professor Unemura was correct in his assertion.

9. Metropolitan Lima includes an area of approximately 3,900 square kilometers (km2), with its urban core of about 261 km2. It covers 30 km from north to south and 25 kilometers from east to west.

Comment: On the map which we will prepared, the various sectors of the City will be identified by informal designation; districts; populations; and economic type of housing (tugurio, pueblo joven, urbanization, middle-class housing)

10. History of Earthquakes in Lima

Lima suffered its first recorded earthquake on July 2, 1552 (there are no records for earthquakes before the Spanish period). At that time, King Carlos V of Spain ordered that no construction in Lima could exceed 6 varas (= 5.20 meters).

On October 20, 1676 at 0415, Lima again suffered a XI level MM earthquake, this time including a Tsunami which destroyed Callao, killing 100 persons.

About sixty years later, at 2230 on October 28, 1746, Lima suffered the worst earthquake until that time and to date. Of 3,000 houses, only 25 remained standing. About 1,141 persons (of a population of 60,000), or about 1.9% of the population was killed. 90 minutes after the earthquake, two Tsunamis destroyed Callao, killing 4,800 or its 5,000 inhabitants. Nineteen vessels and the port were destroyed.

Another sixty years later, on December 1, 1806 Lima suffered a strong tremor which lasted for 1.5 to 2 minutes.

One hundred and thirty years later, on May 24, 1940 at 1135, an VIII MM earthquake caused substantial damage: 180 killed (of which 100 in Callao). In Callao, 5,000 houses collapsed; in Chorrillos 80% collapsed.

Thirty years later, at 1533 on May 31, 1970, an VIII MM earthquake caused 65,000 deaths and massive destruction about 350 km (217 miles) north of Lima. But the actual damages in Lima were moderate.

Note: The above represents a selection of the more serious quakes in the not a comprehensive list.

11. A central hypothesis of the study is that soil quality is the central element in predicting earthquake damage, as depending on the quality of the soil it will absorb more or less of the impact of the seismic waves produced in an earthquake. Of course, the quality of construction of the resources which are analyzed is considered as well.

12. In housing, mostly the more central areas of Lima were considered, and a sample of about 0.95% (less than 1%) of 90,067 houses in the areas studied was used. These houses were located on 194 of a total of 1,881 blocks in the area studied.

The study refers to a 1967 research project which determined that 36% of the population of Lima lived in tugurios (inner city slums), occupying only 5% of the urbanized area of the districts. (Estimates are that 500,000 people live in these conditions in the City at present, but that needs to be checked, Ed note).

The most critical tugurio zones are:

Surquillo	34% of the population live in tugurios
Lima (Old City)	36.6%
San Miguel	28.5%
La Victoria	28.8%

Tugurio housing typically is old construction, 2 to three stories high, made of adobe and quincha, with only one central patio and one exit.

13. Hospitals

See attached chart, listing the hospitals studied and a thumbnail assessment of each.

What needs to be considered, in addition to everything else, is that some of these hospitals are going to collapse on their bed patients, many of whom will not be capable of moving to avoid injury, and who will need immediate medical care after an earthquake. Also, according to the report, 90% of the beds are full at all times. The study estimates 14,500 beds (11,800 in public beds, 2,700 in private sector).

Question: Does this include military hospitals, social security, etc? How many hospital beds will be needed after the earthquake.

14. Schools

The study looked at a 10% sample of 1,417 schools in Lima. Of the 144 schools examined, about 122 are primary schools and 22 are secondary.

About 20% of the primary schools would collapse immediately in an earthquake, while an additional 30% would be so severely damaged that their could not be occupied: a total of 50% of the primary stock out of commission.

Of the secondary schools, only 5% would collapse immediately. But, significantly, about 65% would suffer severe damages renedering them unusable.

For both hospitals and schools, the tugurio areas and environs also have the weakest constructions for these types of buildings.

15. Industrial Buildings

Based on a sample of 92 industrial buildings (representing between 5% and 12% of such buildings depending on the type of industry), about 2% would collapse immediately. About 40% would suffer severe damages (these would break down as follows: food and food processing, 36%; light industry 26%; tobacco industry and heavy industry, 57%).

Of course, the effects on transport, shipping, finance and other areas could affect industry as well.

Breña is the area of Lima where the highest proportion of damage is anticipated (45% of its buildings).

50% of the industries studied had emergency plans, of which none had considered earthquakes. 10% of the factories have equipment and trained personnel to combat fires; 70% have only (I assume fairly small) fire extinguishers; 24% have nothing to fight fires with.

14% have no first aid equipment or medical services; 70% have first aid kits; 16% have some type of on-site medical assistance, of which 10% are on a scheduled basis and 6% are not.

16. Water

Comment: One statement in the study begins, "Además las epidémias pueden afectar a las poblaciones después de los sismos..." (In addition, epidemics can affect the population after an earthquake.). Miguel Gueri might want to talk with the author about this point.

ESAL operates 128 wells. But the Division of Underground Water of the Ministry of Agriculture has about 2,000 wells registered, controlled by private individuals.

17. Electricity

Comment: The study does not address whether the electrical distribution system shuts down automatically when it senses a tremor.

90% of the power comes from hydroelectric centers located in Santa Eulalia and Rímac. In 1972 ELECTRO-LIMA served 425,000 customers (= 1,830,000 people out of a population at that time of 3,355,000). No mention is made in the report of the water services provided by private tankers.

2.9% of its energy goes into well-pumping, as of 1972. 45% goes to industry, 30% to domestic consumption, 16% to commercial services, and 5% to public lighting.

18. Ham Radios As of 1977, there were 750 ham radio station/operators in Lima.

19. Tsunami Information : The first tsunamic wave would likely reach Callao 15 minutes after the earthquake, serving as a sort of warning to the population. But the study recommends preparedness for evacuation and training for people in the area if complete tragedy is to be avoided.

20. Fires

The principal causes of fire projected by the study are:

(a) Short circuits

(b) Breaks or leakages in containers of flammable liquids

(c) Electrical apparatuses which are turned on fall over.

(d) Escaping of flammable gas from leaky tubing

(e) sparks produced in explosive atmosphere

The problem is especially serious in local industries, because of the large variety of machinery and equipment and the presence of raw material and flammable materials, and the density of workers around the area, any one of whom can inadvertently cause the fire.

On the other hand, even in the best of times, water for fire fighting is short: ("...es notorio la desproporción entre la cantidad y disposición de los hidrantes contra incendio y la población actual...")

The volunteer fire corps, called BOMBEROS, "despite its outstanding efforts, it can count today with obsolete equipment; an inadequate number of pumping cars and telescopic ladders..."

Comment: Meaning curtailing the causes of fire is especially important.

With respect to Tokyo's disaster preparedness plan, the study states: Fires are investigated with great dedication...because of the danger of live fires (at the time of an earthquake) or short circuits .

Comment: What would be the feasibility of sending Peruvian officials to an earthquake somewhere else in the world at a moment's notice, so they could get an idea of what they would face?

21. The study proposes that Parques Zonales be used as temporary shelter areas, and that full services be provided by Government to those areas!

22. Comment: What are the benefits of planning?

(a) Faster start on the response - a one-time benefit

(b) Ability to apply policy, not just react to circumstances

(c) Smoother coordination makes response more effective.

23. Bibliography There is a lengthy technical bibliography at the end of the study - of interest to scientists and engineers specializing in the area.