AFFORDABLE HOUSING: INTEGRATING PLANNING STANDARDS, PRICING, AND FINANCE: PAKISTAN

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July 1990

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ABSTRACT

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This paper demonstrates how the design of standards, pricing and finance must be integrated if affordable housing is to be achieved in a sustainable and replicable way. The paper does this by identifying basic principles in achieving affordability and applying these principles through a simple, computer-based integrated-design model to a 'model' housing project in Pakistan. In most instances where there is not a development grant or forgivable loan, affordability must be combined with cost-recovery if projects are to be sustainable and replicable. Keys to such projects are the use of market prices, incremental construction using sweat equity, efficient and affordable standards, differential pricing, and financing using market interest rates but with affordable down payments and repayment rates. The paper demonstrates that the `model' project in Pakistan as designed is not affordable. Through examining several alternative designs using different land-use standards, pricing and financing systems, the paper shows what needs to be done to make such projects affordable. In doing so it illustrates how affordability, standards, pricing, finance, and cost-recovery can be integrated in the design process. While applied to Pakistan, the relevance to Canada of this integrated-interative design process is explored.

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AFFORDABILITY AND THE INTEGRATION OF STANDARDS, PRICING, AND FINANCE\[1]

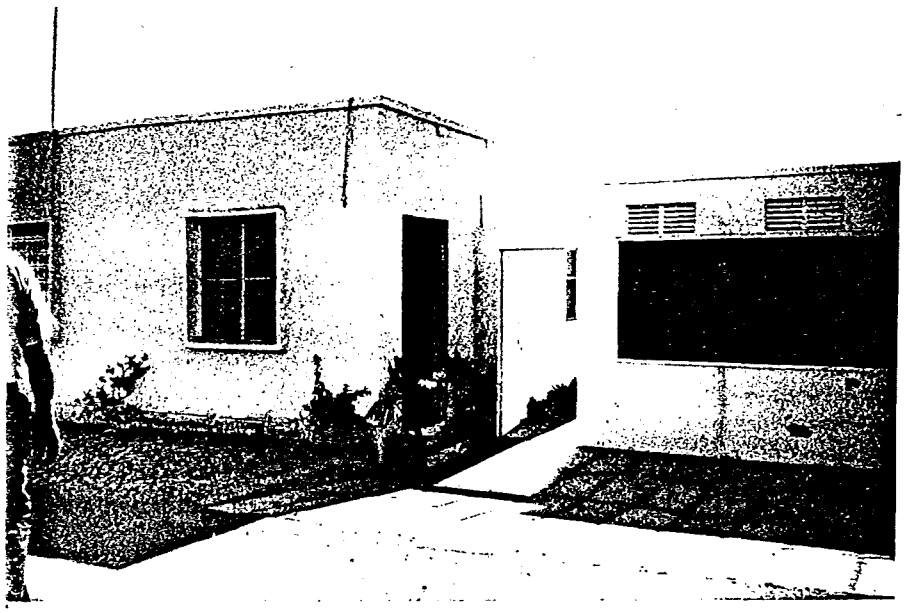
Few governments, if any, can afford to heavily subsidise housing beyond a small proportion for the poorest in society. Widely replicable and sustainable housing solutions for the remaining large numbers of low-income persons typically needing adequate housing, will need to combine consumer affordability with financier cost-recovery (public and private): that is the housing solution has to be affordable to both the consumer and the financier. Such housing projects require an integrated-iterative design process that links appropriate construction, planning, and infrastructure standards with differential pricing and terms of finance\[2]. Such a process will, early in the design stage, identify the basic design parameters within which affordability can be achieved before one or the other parameter is so detailed and its interest group so entrenched as to make adjustments difficult. Such a process can also facilitate early cooperation among the various actors involved - architects, engineers, planners, developers, politicians, and the community - to develop and achieve consensus on these parameters.

Typically, the housing project design process is fragmented not integrated, linear not iterative. Architects, engineers, and physical planners emphasise standards, while private developers and socio-economic planners emphasise pricing and financing. Physical standards are often set before their pricing and financing implications are adequately explored. Politicians torn between poor constituents needing affordable housing, rich constituents wanting standards that protect property values, and financiers requiring cost-recovery and profit, fill the gaps with subsidies. Given limited public

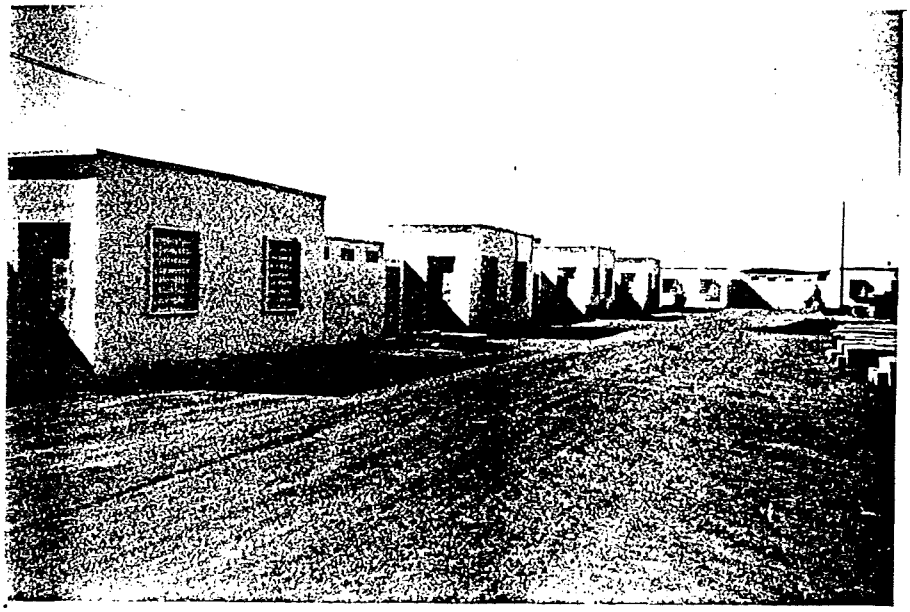
resources, the result is affordable housing meeting only a small proportion of total need. This situtation common in the South also applies to Canada. While an integrative design process alone cannot resolve this problem, by making explicit the trade-offs involved in emphasising only one or the other viewpoint, it can facilitate the necessary compromises required to achieve affordable and cost-recoverable housing.

This paper demonstrates how such an integrated-iterative approach can result in establishing the basic design parameters that make housing both affordable and cost-recoverable. It does so by using a simple computer-based, design model - the Bertaud Affordability Model - to analyze a mixed-income housing project in Pakistan\[3]. The Surjani project of the Karachi Development Authority (KDA) is supposed to be a 'model' for achieving affordable housing, especially for low-income groups. Applying the Affordability Model, the paper demonstrates that, as designed, the project is not affordable and goes on to show how the design parameters can be modified to make it affordable (Figs. 1 and 2).\[4]

In the next section some basic principles for achieving affordability are set out. This is followed by a brief methodological description of the Affordability Model. The Surjani project is then analyzed using this model. Using the iterative capabilities of the model, the project as designed, with land prices well below market rates, is compared with three alternative designs for the project which vary in terms of standards, pricing, and financing conditions. Each design alternative illustrates specific points about achieving affordability with the last alternative establishing a set of



Figs. 1 and 2 Unnecessarily high housing construction standards and wasteful land use (e.g. unnecessarily wide streets) makes the project unaffordable to the poor.



design parameters that would result in an affordable and feasible solution. The final section of the paper cautions against some potential misuses of the approach and of the Affordability Model in particular.\[5]

PRINCIPLES OF ACHIEVING AFFORDABILITY

Before proceeding with a discussion on affordability and how it is operationalised, it is useful to define some basic terms and their expression in the Affordability Model. Housing refers interchangeably to housing plots and the housing units on them. Consumer affordability here refers primarily to an affordable percentage of housing expenditures to total income. In the model this is expressed in terms of a percentage of monthly income spent on housing (for example Fig. 3, line 61). Financier affordability or cost-recovery refers to returns on housing investment that are considered acceptable to the financier of the project. In the model, and in this paper this is expressed in at least breaking-even, with preferably a margin of surplus (line 66). Standards here are technology, service, and space standards such as more or less expensive technologies for constructing infrastructure, and varying plot sizes and road widths. Differential pricing refers to pricing commercial and upper-income housing above the average developed land cost per net m2 and having enough of that type of land-use, to be able to reduce the price of the lower-income housing (whose price is below average developed land cost) to affordable levels (line 46). Note that the commercial and upper-income prices must nevertheless remain competitive. Financing refers to the terms under which finance is made available: down-payment, interest rate, loan term, etc. (lines 52 to 55).

FIG. 3: AFFORDABILITY MODEL SPREADSHEET

SCEN.III. SURJANI PROJ. MORE EFFECTIVE STANDARDS, PRICING AND FINANCING SYS.

I - LAND AND DEVELOPMENT COSTS		Base cost /m2	Percentages Physic. Conting	Design Sup.Mg	Inter. Constr	*TO BE RECOVERED $/m2	
Land	cost/gross m2	200.00	0.00	0.00	0.00	200.00	
Site preparat.	" /m2	0.53	0.00	0.00	0.00	0.53	
On-site infrast.	" /m2	20.67	0.00	0.00	0.00	20.67	
Off-site infrast.	" /m2	22.55	0.00	0.00	0.00	22.55	
Other developmt	" /m2	0.00	0.00	0.00	0.00	0.00	CONSTRUC.
CONSTRUCTION COST	Area m2						*COST/UNIT
Superst. Unit #1	0.00	0.00	0.00	0.00	0.00	#1	0
" Unit #2	0.00	0.00	(Same % as unit #1)			#2	0
" Unit #3	0.00	0.00	"	"	"	#3	0
" Unit #4	0.00	0.00	"	"	"	#4	0
" Unit #5	0.00	0.00	"	"	"	#5	0
" Unit #6	0.00	0.00	"	"	"	#6	0

*DEVELOPED LAND COST/GROSS m2 TO RECOVER TO BREAK EVEN : 243.75

II - LAND USE & PRICING OF NON-RESIDENTIAL LAND

		*PERCENT	Non-Residential Devel. land price per net m2
Total area in ha	139.00	100.00 %	
Circulation in %	15.00	20.85 ha	
Open Space in %	5.00	6.95 ha	
All comty facs. m2	111200	8.00 %	0.00
(Ed.,Health, etc)	0	0.00 %	0.00
	0	0.00 %	0.00
Commercial facs.m2	111500	8.02 %	700.00
Commercial #2 m2	0	0.00 %	0.00
Commercial #3 m2	0	0.00 %	0.00
Other facilities m2	0	0.00 %	0.00
*TOTAL MARKETABLE m2	1112000	80.00 %	
*TOTAL RESID.AREA m2	889300	63.98 %	
*TOTAL NUMB.OF PLOTS	5256	Plots/ha:	38 Hshd size: 7
*POPULAT. DENSITY/ha	246		

*DEVELOPED LAND COST/NET m2 TO RECOVER TO BREAK EVEN : 304.69

III - PRICING & AFFORDABILITY OF RESIDENTIAL PLOTS

Resid. plot types	#1	#2	#3	#4	#5	#6	#7
Month. income/hshd	700	850	1000	1500	3000	6000	0
Plot size in m2	50.00	72.00	105.00	160.00	250.00	500.00	0.00
Plot/type percent.	5.00	45.00	12.00	12.00	11.00	15.00	0.00
*NUMB.OF PLOTS/TYPE	263	2365	631	631	578	788	0
Dev.landprice/netm2	100.00	140.00	150.00	180.00	350.00	400.00	0.00
con+mat loan	10000	10000	10000	10000			0
Other cost/plot	0	0	0	0	0	0	0
*TOT.CAPITAL COST/H	15000	20080	25750	38800	87500	200000	0
Down paymt percent	20.00	20.00	25.00	25.00	30.00	30.00	0.00
" " lump sum							0
Interest rate/year	12.00	12.00	12.00	12.00	12.00	12.00	0.00
Loan term (years)	15	15	15	15	15	15	0
*MONTH.MORTGAG.PYMT	144.02	192.79	231.78	349.25	735.10	1680.24	0.00
Water&elect.charge	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other month.charges	0.00	0.00	0.00	0.00	0.00	0.00	0.00
*TOTAL MONTH.PAYMENT	144.02	192.79	231.78	349.25	735.10	1680.24	0.00
* %OF MONTHLY INCOME	20.57	22.68	23.18	23.28	24.50	28.00	0.00

NOTES

* indicates outputs

Values in Pakistani Rupees
1US$=Rs17.50
(Dec.1987)

IV - COST RECOVERY

*DEVELOPED LAND COST RECOVERABLE PER NET m2 :	305.37	
*DEVELOPED LAND COST/NET m2 TO RECOVER TO BREAK EVEN :	304.69	
*SURPLUS OR DEFICIT IN MILLIONS AND PERCENT :	0.76	0.22%

Achieving affordability is closely linked with achieving appropriate standards, pricing, and financing. Defining what is appropriate can be problematic.\[6] An empirically rooted, rule of thumb approach would be to adopt the perspective of the target groups to be served. That is to examine the existing housing conditions of those groups and offer standards that are significantly higher, but not so much higher that they make pricing and financing unaffordable. A common error is to provide standards and conditions that are so different from the existing conditions as to be unaffordable and/or wasteful. An example would be inappropriately large `park' spaces that are used instead as rubbish tips while raising development costs. The result is both a health hazard and an increase in monthly payments on plots far beyond what the target groups are currently paying and can afford to pay.

Information on which to establish more precise measures of appropriateness would emerge, as mentioned, from country and site-specific studies that complement this particular affordability analysis. From studies and experiences in the South comparing informal-housing settlements with formal private developer and government funded housing, the following principles can be distilled.\[7]

Adopt More Efficient Land-Use and Infrastructure Standards

1. Design site layout to more closely reflect the real circulation needs of the various groups. That is, use a stepped hierarchy of circulation routes--main roads, secondary roads, lanes and pedestrian ways--with a greater use of the less land-consuming lanes and pedestrian ways than typically done in current designs.

2. Reduce open, especially park, spaces to sizes that realistically reflect community needs and maintenance capabilities of community and local authorities. Improve efficiency through shared use such as between schools and the community at large and design pedestrian areas to double as open play spaces.

3. Let plot sizes be somewhat larger than those the target group are currently housed in but not substantially larger. This will make it more likely that plot costs are affordable.

4. Make plot frontages narrower to reduce service lengths and thus reduce service costs.

The above steps can result in:

5. An increase in the number of plots per unit of land and thus a reduction in land costs per plot.

6. An increase in net marketable area: ratio of marketable plots to non-marketable circulation and open space, and thus an increase in the sources of cost recovery.

The above principles are practiced in low-income, informal housing settlements in the South. Formal government or large private-developer housing projects tend to be more wasteful. The principles could be applied to such projects,

reducing waste, and yet producing a housing environment noticeably superior to those in the informal settlements. The trick is to achieve affordability without replicating slums, which is a real concern. Projects applying the above principles have demonstrated this can be done (An example in Pakistan is the Swathi-South project of the Peshawar Development Authority). To do the same in Canada, implies a similar revision of standards. Objections to such revisions should distinguish between those emanating from and representative of the relatively wealthy who in defence of their property values may in effect be denying the poor their right to affordable housing (the NIMBY - Not In My Back Yard - syndrome common in Canada), and those clearly demonstrating that such revisions would indeed result in socially unacceptable housing conditions.\[8]

Use Differential Plot-Use and Pricing to Reflect Best-Use and Plot Values

1. Design plots for commercial and upper-income residential uses rather than low-income residential uses at locations attractive to such commercial and upper-income groups (along main roads, at road junctions etc.).

2. Price such plots to reflect their true market value which will be above the average developed land cost/net m^2.

The above steps can result in an increase in the share of total costs recovered, which are paid by upper income groups and thus reduce the share

paid by the lower income groups. Note that this shift in shares is done on the basis of payment in proportion to value received (larger plots, fronting wider roads, etc.) and not a case of the rich cross-subsidising the poor.

Take into account that there may be some loss of utility for upper income groups living near lower income groups resulting in the need for a price discount. There may even be a 'tipping point' i.e. a threshold of the ratio between rich and poor residents, beyond which the project becomes unattractive to the prospective wealthier residents. This has been noted in both the south and in the Canadian context. It may be one reason why differential pricing has not been fully used in mixed-income non-profit programs in Canada. (Interviews with managers of City of Ottawa Non-Profit Housing Corporation, May 1990)\[9]. Placing larger plots (or higher standard housing units in the case of Canada) for upper-income groups in more attractive locations as suggested, should reduce these tendencies. On the other hand, some evidence suggests that there are clearly common or shared benefits in living in mixed-income housing areas. In India and Pakistan, both rich and poor benefit from proximity, for example when poorer residents provide household services to richer residents. In Canada, this author has benefited from living in a mixed-income neighbourhood in which neighbours can offer each other a hairdresser working out of her back-room, an appliance repairman willing to make repairs in the evenings, and a cabby available to deposit 6-year olds to piano lessons at short notice.

Encourage Incremental, Owner-built, House Construction

Instead of constructing complete housing units for plot-owners, limit superstructure construction to critical components such as on-plot sanitation or core units. Let owners incrementally construct their own housing, perhaps with the assistance of small construction loans. Housing quality and construction can be assured through such means as requiring a minimum standard necessary for health and safety, a time period during which a minimum unit must be completed, and tying loan disbursement installments to construction stages.

For cost, quality control and other reasons, housing owner-cooperatives (cooperative finance, materials purchase, or construction) may also be an effective half-way measure between projects that deliver the completed house and projects that leave house construction entirely to the individual owner.

There is ample evidence in the South that incremental, owner-built housing is more cost-effective than those constructed by governments or large developer-contractors. The owner can also better control his or her construction expenditures to keep pace with his or her income and cash-flow requirements for other household needs. Mortgage payments are also significantly reduced. All this is especially important for low-income groups whose incomes are irregular and often so close to subsistence that other unexpected demands on their incomes (an unexpected sickness for example) can periodically drastically reduce the income available for construction or mortgage repayments.\[10]

In Canada the same principles may apply ranging from greater owner control over the housing process to incremental, owner-built construction based on sweat-equity (see for example Rowe, A. Ph.D. Thesis). The housing cooperative movement, applying some of the above principles is active in Canada. Homelessness may be largely an urban phenomenon, although rural households are poorer in terms of measured income. Although homelessness is a complex social phenomenon that goes beyond housing affordability, in part, at least, this shelter differential may result because rural households can more easily adopt the more affordable incremental, owner-built housing option. Some evidence also suggests that a big loss in utility to owners and tenants results from their being unable to choose their preferred housing characteristics, something they can more easily do in an owner-built option (see De Borger, B. 1987).

Affordable Financing Terms

1. Set percent of down payment to a level that the low-income groups can realistically raise from savings and borrowings.

2. Set interest rates at market levels to ensure the financing system can attract savings and not be decapitalized and become dependent on government subsidies, thus endangering sustainability.

3. Ensure repayment period is not substantially longer than what the target group are used to in borrowing in the normal, often informal, credit

market. Too long repayment periods will increase the likelihood of repayment defaults and weaken the collection capability and will of the collecting institution.

Affordability Test

1. Consumer Affordability: Ensure overall monthly payment is not substantially greater than the payments made by the target group for their current housing. Even if the housing being offered is much better than their current housing, we cannot assume this group have the necessary financial reserves from which to substantially increase payments. In the present project analysis monthly payments of below 25% of total income are assumed to be affordable, with a typical 10% to 25% range.\[11]

2. Financier affordability: Ensure there is a surplus and not just a break-even in cost recovery to provide a margin for error. The surplus amount would also reflect the extent to which cost values may have to be revised upwards.\[12]

In the next section, we shall briefly outline the methodology of the Affordability Model before applying it to the Surjani case.

METHODOLOGY OF THE AFFORDABILITY MODEL (FIGURE 3)\[13]

The model is set out on the Lotus 123 spreadsheet program. Briefly, the model is in four parts. The first part - land and development costs (Figure 3, lines 3 to 19) - estimates the developed land cost per gross m2. that has to be recovered if the project is to break even (line 19). This estimate is obtained by inputting the basic land and development costs. The second part of the model - land use and pricing of non-residential land (lines 21 to 38)- gives us the developed land cost per net m2 of residential land, that must be obtained on average from residential land sales to break even (line 38). This is obtained by inputting land use data and pricing of non-residential land. Among other things, the land use data gives us the total marketable area and within it, the total residential area of the project (lines 33, 34). Pricing of non-residential land gives us the sale value of such land. Combining both, we get the required residential land cost per net m2.

In the third part of the model, pricing and affordability of residential plots are analysed (lines 40 to 61) giving us the total monthly payments to be made (lines 60, 61). This involves the following: setting the proportion and pricing of residential plots by plot size and income group (lines 41 to 48), giving total capital costs (line 50); analysing these against financing terms - down-payment, interest rate, loan term etc (lines 52 to 55) - which in turn gives the monthly repayment (mortgage) amounts (line 57). These amounts combined with other monthly charges (lines 58, 59) give us the total monthly payments on housing and their percent of total monthly income (lines 60. 61). These monthly payments are then checked against what is considered affordable

for each income group. Also checked, in part four of the model, is whether cost recovery is taking place (lines 63 to 66): that is whether the amount charged per net m2 of marketable land (developed land cost recoverable per net m2 - line 64) exceeds or is less than the developed land cost per net m2 that must be recovered to break even (line 65). The resulting surplus or deficit is given in Rupees and percent (line 66).

If either consumer or financier affordability (cost recovery) is questionable, different parameters regarding the standards (construction and land-use), pricing and financing terms are attempted. Through several iterations, affordable and cost-recoverable parameters are identified which serve as a basis for more detail design.

Although the Surjani example here confines itself to the `computer modelling' of the parameters and stops at the stage when affordable parameters are identified, it should be noted that this computer modelling should be linked with physical modelling or design in the same integrated-iterative manner through which it identifies the affordable parameters. The complete affordability model does this through computer-aided design, but this can also be done in the more conventional drawing-design way. That is the translation of the parameters to physical design solutions should accompany and in turn influence the choice of the parameters. Thus preliminary sketch design may influence the first choice of parameters and detailed physical design may require some modification of the affordable parameters arrived at through computer modelling of those first parameters.

APPLYING THE MODEL: AFFORDABILITY ANALYSIS OF THE SURJANI PROJECT

The above model is applied to Surjani as designed, using below-market land prices compared to three alternative scenarios. These are based on Surjani but incorporate market prices for land and varying standards, other prices and financing terms. The three alternative scenarios are, (i) Surjani using market prices for land (considered the 'Surjani Model'), (ii) Surjani applying the G.O.P.'s new planning standards, and (iii) Surjani with standards, pricing, and financing changed to achieve affordability (the proposed model).

Surjani as Designed Using Below-Market Land Prices (Figs, 4, 5, 6, Appendices Spreadsheets 1,2,3)

As designed the Surjani project should be highly profitable if plots and housing units are sold (Fig. 4, Appendices Spreadsheet 1). While developed land costs per net m^2 are Rs. 117 (line 38) most of the developed land sale prices are well above that amount (line 46). The result is a substantial 41% surplus (line 66). This high net return results from adopting a number of questionable parameters that even if applicable to this context, are unlikely to be replicated in similar contexts elsewhere. The most important of these questionable parameters are discussed below.

Land prices at Rs. 22.85/m^2 are well below the more representative market prices of about Rs 200/m^2 in similar peripheries of major urban centres in Pakistan (line 6, cell D6). Down payment schedules are unrealistically high: for example the household income group of Rs. 1324/month are expected to make

Figure 4: Surjani as Designed: Using Below-Market Land Prices

Spreadsheet Line No.	Design Parameters						
6	Land Cost/Gross m2 (Rs)						23
19	Developed Land Cost/ Gross m2 (Rs)						67
38	Developed Land Cost/ Net m2 (Rs)						117
42	Mthly,Income/Hhld. (Rs)	700	850	1,000	1,500	3,000	
44	Plots/Type (%)	52	22	10	16	0.17	
46	Developed Land Price/ Net m2	100	150	200	200	250	
47	Superstructure (Housing Unit) Cost/Plot (Rs)	30,000	30,000	30,000	30,000		
52	Down Payment (% of Total Capital Cost)	20	20	30	40		
54	Interest Rate (%)	8	8	8	8		
61	Mthly. Repayment (% of Mthly. Income)	40	42	51	42		
66	Surplus or Deficit (Million Rs and %)						38,41

Figure 5: Surjani as Designed: Reducing Developed-Land Price

Spreadsheet Line No.	Design Parameters						
6	Land Cost/Gross m2						23
42	Mthly. Income/Hhld. (Rs)	700	850	1,000	1,500	3,000	
46	Developed-Land Price/ Net m2 (Rs)	30	75	100	175	200	
47	Superstructure (Housing Unit) Cost/Plot (Rs)	30,000	30,000	30,000	30,000		
61	Mthly. Repayments (% of Mthly. Income)	35	35	36	38		
66	Surplus or Deficit (Million Rs and %)					2.33,2.52	

Figure 6. Surjani as Designed. Replacing Housing Unit with Construction Loan

Spreadsheet Line No	Design Parameters						
6	Land Cost/Gross m2 (Rs)						23
35	Plots/ha						32
42	Mthly. Income/Hhld. (Rs)	700	850	1,000	1,500	3,000	
46	Developed-Land Price Net m2 (Rs)	95	100	105	110	250	
47	Construction Materials Loan	10,000	10,000	10,000	10,000	0	
61	Mthly. Repayments (% of Mthly. Income)	18	19	23	20		
66	Surplus or Deficity (Million Rs and %)						1.8,195

Figure 7. Scenario 1: Surjani Using Market Prices for Land

Spreadsheet Line No	Design Parameters						
6	Land Cost/Gross m2						200
19	Developed-land Cost/ Gross m2 (Rs)						244
24,25	Circulation and Open Space (% of Total Area)						43
29	Commercial Land (Price Rs/Net m2% of Total Area)						1175,8
35	Plots/ha						16
38	Developed Land Cost/ Net m2 (Rs)						427
42	Mthly. Income/Hhld. (Rs)	700	850	1,000	1,500	3,000	
44	Plots/Type (%)	48	22	10	16	4	
46	Developed-Land Price/Net m2	120	125	130	135	500	
66	Surplus or Deficit (Million Rs and %)						2.54,0.75

a down payment of 40% of total price of the house or Rs. 39,000 (line 52.U.S.$1 = Rs.17.50. December 1987). Interest rates of 8% constitute a significant government subsidy (market rates are typically 12% to 15%). Despite the high down payments and low interest rates, monthly repayments are unrealistically high, ranging from 40% to 50% of gross monthly household incomes (line 61 - a more affordable range would be 15% to 25%). Even if developed land sale prices are much reduced (Fig. 5, Appendices Spreadsheet 2, line 46) monthly payments remain unaffordable (line 61, 35% to 38% of monthly income). The reason is the high cost of the completed housing unit (line 47). These parameters suggest that the plots and units would either be sold to upper-income groups, or that the low income groups would default on repayments. Past experience on similar housing projects, supposedly for the lower income groups, confirms this result.

Fig. 6, Appendices Spreadsheet 3 shows that Surjani could be made affordable to the designated low income groups and still break even by a) reducing land sale prices (line 46), and b) providing construction loans of Rs. 10,000 (line 47) instead of requiring the beneficiaries to borrow for the completed housing units at Rs. 30,000 or more per unit. As discussed, experience suggests that through incremental construction and sweat equity the beneficiaries could construct their units more affordably than if government agencies undertook the construction.\[14]

If market prices for land were used however (Rs. 200/m^2), a 72% deficit would result. To break even a more radical redesign would be necessary.

Scenario I: Surjani Model Using Market Prices for Land (Fig. 7, Appendices Spreadsheet 4)

At undeveloped land sale price of Rs. 200/m^2 (line 6), land development costs rise from Rs. 66/m^2 gross to Rs. 243.75 gross, and Rs. 427.18 net (lines 19, 38). At such land costs, developed land sale prices would have to increase substantially (line 46). To remain affordable more efficient land-use planning and the use of differential pricing would become critical. If, as in this scenario, Surjani's land use standards are maintained with circulation and open space at 43% of the total area (lines 24, 25), a much greater use of differential pricing is required. For example, the number of smaller plots are reduced and the number of larger plots are increased, especially those priced at above average land development costs (line 44, 45). The already high proportion of commercial land (8%) is maintained, but sale prices are increased (line 29). Plots per hectare, especially smaller plots, affordable to the lowest income groups are consequently much reduced (down to 16 and 7 respectively-lines 35, 45, from the previous case of 32 and 17). It is also questionable whether there is an adequate market for the increased numbers of residential plots and commercial plots at the higher prices they would need to be sold at to break even.

Scenario II: Surjani Using the GOP's New Planning Standards (Fig. 8, Appendices Spreadsheet 5) (GOP 1986)

A major difference between this scenario and the previous one is the greater efficiency of land use that is achieved by revised standards. Circulation and

Figure 8. Scenario II: Surjani Using GOP's New Standards

Spreadsheet Line No	Design Parameters						
6	Land Cost/Gross m2 (Rs)						200
19	Developed Land Cost/ Gross m2 (Rs)						244
24,25	Circulation and Open Space (% of Total Area)						30
38	Developed Land Cost/ Net m2 (Rs)						348
42	Mthly. Income/Hhld (Rs)	850	1,000	1,500	3;000	6,000	
44	Plots/Type (%)	15	15	10	30	30	
46	Developed Land Price/ Net m2 (Rs)	190	200	250	400	410	
66	Surplus or Deficit (in Millions Rs and %)						1.10,0.32

Figure 9. Scenario III: Proposed Model. Surjani Using More Effective Standards, Pricing and Financing

Spreadsheet Line No	Design Parameters						
6	Land Cost/Gross m2 (Rs)						200
19	Developed Land Cost/ Gross m2 (Rs)						244
24,25	Circulation and Open Space (% of Total Area)						20
29	Commercial Land (Price Rs/Net m2 and % of Total Area)						700, 8
34	Residential Area (% of Total Area)						64
35	Plots/ha						38
38	Developed Land Cost/ Net m2						304
42	Mthly. Income/ Hhld. (Rs)	850	1,000	1,500	3,000	6,000	
46	Developed Land Price/ Net m2 (Rs)	100	140	140	180	350	
66	Surplus or Deficit (Million Rs and %)						0.76, 0.22

open space percentages drop from a wasteful 43% down to 30% (lines 24, 25). Consequently, developed land cost/net m^2 is reduced from Rs. 427 to Rs., 348 (line 38).

However, differential pricing is restricted under the new GOP standards. This limits maximum plot sizes to 500/m^2 (1000/m^2 under exceptional conditions) and commercial land to 3%. Consequently opportunities are restricted for selling plots in prime locations at their true market value, and above the average developed land cost. Therefore, either a larger proportion of the increased land costs have to be borne by the low-income groups, which would make the plots unaffordable, or alternatively, a much larger proportion of the total plots have to be allocated to the middle and upper-income groups thus reducing the participation of the low income groups.

In this scenario affordability is achieved by allocating 60% of the plots to the upper income bracket (line 44) with a much reduced number of smaller plots per hectare for low income groups (3%, Fig. 10).

Scenario III: Proposed Model: Surjani, Using More Effective Standards, Pricing and Financing (Fig. 9, Fig. 3)

In this scenario more realistic parameters are applied to make the project more affordable and replicable. These parameters are market prices for land, greater number of small plots for the lowest income groups, including 2 marla (50 m^2) plots, market interest rates (line 54), and reduced down-payments (line 52)\[15]. The scenario then illustrates what would be required to achieve

greater affordability than the previous alternatives which were operating under less stringent conditions.

Land-use standards would have to become even more efficient than proposed under the new GOP regulations. For example, circulation and open space would have to be revised down from 30% to 20% (line 24, 25). Such efficiencies have been regularly achieved with good effect in similar projects internationally. The Peshawar Swathi-South project gives a potential Pakistani example.\[16]

Differential pricing would have to be more effectively applied. In this case the sources for obtaining higher than developed land cost returns are more distributed between commercial users and upper-income residential households than in Scenario II. In Scenario II upper-income households had to carry most of the burden since commercial land was kept at under 3% of the total project area. Sale prices of commercial and upper-income plots are thus brought down to levels that may represent more realistic market conditions (commercial: from Rs. 1000/m2 to Rs. 700/m^2; upper-income residential: from Rs. 400/m2 to Rs. 350/m^2, lines 29, 46). Sale prices of low income plots can also thus be reduced from Rs. 190/m^2 to Rs. 140/m^2 for a 72 m^2 plot. They remain only slightly higher than Scenario I in which unrealistically high commercial land prices were assumed.

The results are a) much reduced land development cost/net m^2 (Rs. 304, line 38), b) a reduced smallest-plot price of Rs. 5000 (cell D43 * cell D46), c) plots per hectare increased to 38 (line 35) with smaller plots - 50m2 and 72m2

- per hectare increased to 19 (cell CD45/ cell23), and d) residential area increased to 64% (line 34).

Summary

Fig. 10 summarises the relative performance of the three scenarios: Scenario I, the Surjani model (Fig. 7, Appendices Spreadsheet 4); Scenario II, using GOP's new planning standards (Fig. 8, Appendices Spreadsheet 5); and Scenario III, the proposed model (Fig. 3, 9). The proposed model offers the most affordable plots, residential and commercial, with the largest number of low-income plots at market rates of interest, and a competitive down-payment and monthly repayment schedules. It achieves this by applying the principles of more efficient and effective land-use and differential pricing outlined in Section II of this paper. It is able to achieve the above by adopting the integrated-iterative design approach using the affordability model.

It is important to note that the substantial cost-savings in services resulting from more efficient land use planning were not computed and therefore are not reflected here. Scenario II and especially Scenario III would therefore, be expected to perform considerably better than recorded here.

The GOP's new planning and infrastructure standards are in some respects a significant improvement on the old standards used in the Surjani Township. The new standards demand more efficient land-use planning, as reflected in the

FIGURE 10. **COMPARING SCENARIOS I, II AND III**

SCENARIOS / CHARACTERISTICS	I SURJANI MODEL (Fig. 3)	II GOP's NEW STANDARDS (Fig. 4)	III PROPOSED MODEL (Fig. 5)
LAND USE (%OF TOTAL AREA)			
Residential	45%	57%	64%
Facilities (Social, commercial etc)	12%	13%	16%
Circulation + Open Space	43%	30%	20%
LAND DEVELOPMENT COSTS			
Gross per sq.m	244	244	244
Net per sq.m	427	349	305
DIFFERENTIAL PRICING			
Marketable Area (% of total area)	57%	60%	70%
Largest House Plots(%of tot. plots)	4%	30%	15%
Largest House Plots.Rs/m2(Rs/marla)	500 (12000)	410 (9840)	400 (9600)
Commercial Plots (%of total area)	8%	3%	8%
Commercial plots: Rs/m2 (Rs/marla)	1175 (28200)	1000 (24000)	700 (16800)
FINANCING (For Rs700/hhd/mth)			
Down payment (%of income)	20%	20%	20%
Interest Rate (%)	8%	8%	12%
Repayment Period (years)	15	15	15
AFFORDABILITY	[above make smallest plots affordable to lowest income groups (Rs700/hhd/mth)]		
Smallest Plots Size (m2)	70	72	50
% of total plots less than 72m2	48%	15%	50%
No. of 50m2 and 70-72m2 plots/ha	7	3	19
Total Plots per Ha.	16	21	38
Smallest plot price:Rs/m2(Rs/marla)	120 (2880)	190 (4560)	100 (2400)
Smallest plot price: (Rs/plot)	8400	13680	5000
Mthly. paym. as %of mthly. income	20.1%	21.3%	20.6%

NOTES

Actual costs will be lower once savings in reduced circulation, roads, and service lengths are accounted for.

Values in Pakistani Rupees
1$US=Rs17.50 (Dec.1987)

1 marla approximately = 24 metres

reduction in percentages of circulation. However, further reductions are required.

Furthermore, the new standards impose limitations that may make the achievement of affordable shelter even more difficult. The limitations on plot sizes (maximum and minimum) and a 3% percent ceiling on commercial use, significantly restricts the use of differential pricing. The result, as illustrated in Fig. 10, is that in several respects the performance of Scenario II using these new standards is worse than the performance of Scenario I in which the old standards are used. For example, for the project to break even, the sale price of the smallest plot has to be higher since there is less scope for differential pricing to reduce plot costs.

The limited evaluation done in this paper of the GOP's new standards thus suggests three areas for further improvement.

1. Land-use planning standards would have to be made even more efficient such as by further reducing the proportion of circulation space and public open space.

2. Limitations on mixed use need to be relaxed if the full potential of differential pricing is to be utilised. An example is the relaxation of the 3% limit on commercial land.

3. Minimum plot sizes should be reduced from 3 marlas, (72 m^2) to two marlas, (50 m^2) to cater to even lower income groups.\[17]

SOME CAUTIONS

The purpose of this paper was to demonstrate how an integrated-iterative process of housing project design could contribute to achieving affordable and sustainable housing design parameters. The linking of consumer affordability (affordable sale price) with financier affordability (cost-recovery), and the linking of standards, pricing, and financing is central to this process. The Bertaud Affordability Model makes such a process possible. The model is an exploratory ("what if") tool of considerable value. It makes it easy to demonstrate the implications of assumptions and decisions across a range of variables. The model is therefore of particular value to housing profesisonals, municipal governments and community groups who have to make housing decisions based on a range of often rapidly changing circumstances. While applied to and of particular relevance to the South, the process suggested here is relevant in varying degrees to Canada.

However, all processes and methodologies should be used with caution. The major value of the process is in what it makes possible; the major danger is that a biased use is made of these possibilities.

Perhaps the greatest value of the process is that it makes explicit the linkages and trade-offs between the parameters of affordability, standards, pricing, financing and cost-recovery. For example the trade-off between increasing plot-size and resulting increase in costs, and therefore reduction in affordability, can be directly assessed. But so can the trade-off between increasing interest rates with the same results. The decision on whether plot-

size or market interest rate is to be compromised to achieve affordability or how much of one or the other should be compromised must, in the final analysis, be a judgement call based on a combination of social, economic, and political criteria emanating from the conditions of the specific case. Although in principle, as suggested in this paper, lower interest rates risk decapitalising the funding source, and subsidies cannot sustainably make up for large short-falls in housing needs, both can be justified in certain circumstances. By making explicit, even quantifying the relative trade-offs in alternative ways of achieving affordability, the model assists in making, but must not be allowed to determine, the decision.

The mystique of a computer model and the fact that it can be manipulated in the relative ease and isolation of a quiet office may encourage its use in isolation of the other actors - other professionals and the communities involved in the housing process. The "magician-technocrat" can emerge from this peaceful isolation to present the others with the solution. Alternatively key professionals, financiers, and community representatives can gather around the computer and discuss and argue their way through various scenarios and iterations, seeing clearly and immediately the potential results of their particular preferences and the compromises all have to make, to achieve an affordable solution. It has therefore significant interactive and indeed collaborative capabilities. From this writer's personal experience of the latter use of the model, it is this type of use that realises the full potential of the process. The former use is also, unfortunately not uncommon and must be cautioned against.

Similarly, the self-contained nature of the model may encourage its use to the neglect of the essential and complementary settlement and site specific studies urged in this paper. These studies are essential for providing reliable information as input to the model, to interpret its results, and to draw conclusions regarding actions to be taken as a result. Without these studies and the information and insights they offer, incorrect or misleading results may be obtained, and inappropriate actions taken. "Garbage in, garbage out."

In the same vein, as mentioned earlier, an integrated-iterative dialogue should be established between this computer modelling exercise and physical design, moving back and forth as parameters calculated by the model are tested and developed in drawings. There is a danger that this computer modeling may be allowed to proceed in isolation, or unduly to influence the physical design process.

Finally as in all quantifiable processes, there is the danger of reducing human issues to computed numbers, human processes to a `numbers game'. We must constantly remind ourselves that ten meters taken off a plot may mean no room for the children to do school-work in quiet. On the other hand, an extra hundred rupees monthly payment because 10 meters were not taken off may mean in some months, no food for the children or the risk of eviction. These are the real trade-offs underlying the numbers. They must be kept in the forefront as we design.

Using the integrated-iterative design process and the affordability model with these cautions in mind gives us a powerful tool for helping resolve the affordable housing problem in a sustainable way.

ENDNOTES

1. This paper owes much to two World Bank colleagues: Alain Bertaud who developed the Affordability Model and introduced me to it, and Jim Wright with whom I worked with when first using this model in India and Pakistan. I am also most grateful to two of my University of Guelph colleagues for their insightful comments on early drafts of this paper: Professor David Douglas, of the University School of Rural Planning and Development and Professor Marion Steele of the Economics Department. Thanks also to Dr. Tom Carter of the Institute of Urban Studies, University of Winnipeg for his very useful comments. Any errors, omissions or questionable statements are, of course, entirely my responsibility.

2. The term 'design' here includes both the physical (land-use, infrastructure, dwelling unit) and the economic (pricing and financing) design of the project. The term 'housing project design' refers to the design of the residential area and the housing process rather than to the physical design of the dwelling unit itself.

3. The Bertaud model, using the Lotus 123 program, was developed by Alain Bertaud with the assistance of the Planning and Development Collaborative PADCO) and the World Bank. (World Bank/PADCO 1986). The model is used in conjunction with country, settlement, and site-specific analysis of existing housing conditions covering physical conditions, land and housing markets, standards, costs and regulations, and user views. This author has used the model on missions for the World Bank and other aid agencies, assisting in housing programs and training others in its use.

4. The Surjani case analysis is drawn from work done by the author for the World Bank as part of its Pakistan Shelter Sector Review. Data for the Surjani Project was provided by the Karachi Development Authority.

5. Note that this process focuses on design at the project level and takes prices as given, which is what most housing-project designers are forced to do. Clearly a more systemic and long-term approach would be to attempt to reduce prices of the major inputs (land, materials and labour, and finance) through such measures as land-banking, local construction materials micro-enterprises, etc. This would be policy and planning measures at the larger, municipal, provincial, and national scale promoted over a longer period: an effort which should parallel the more immediate, project level and affordable-design measures discussed here.

6. The literature on affordability and appropriate standards, pricing and financing is voluminous. The effective integration of these in designing housing projects is not as well explored. A recent text, focussing on the South, successfully summarises this literature and the current 'state of the art'. See Rodwin, L. 1987.

7. Informal housing areas are characterised by incremental construction, owner or small contractor built with little government intervention. Formal housing areas are typically built by government or large developers-contractors on a turn-key basis. This author's experience is drawn largely from housing projects in the South: specifically the Philippines, Indonesia, India,

Pakistan, and Iran (for example Afshar, F., 1980; World Bank, 1988). The relevance to Canada of the principles discussed here was most recently underscored at a seminar on Ontario's new housing policy at which similar issues and principles were emphasised (Seminar on "Affordable Housing and Residential Land Development" Toronto, Jan. 30, 1990. For example presentation of M. Michael, Commissioner, Durham Municipality).

8. The author knows of at least one Native Canadian housing project that, through adopting inappropriately high standards requiring higher housing payments, bankrupted its 'beneficiaries' forcing them to forego other more essential expenditures.

9. Recent evidence indicates other constraints to the use of differential pricing in Canada. Political objections have been raised against upper income households occupying units in non-profit housing even though such households out of a belief in such housing are willing to pay full market rents that could reduce overall subsidies required for lower income groups (Yeo, M. 1990).

10. For early documentation on incremental construction see for example Turner, J. 1972. For more recent reconfirmation see Rodwin, L. 1987. For incremental construction and self-help housing in the Canadian context see for example, Rowe, A.C. Ph.D. Thesis. For a current Pakistani example extending incremental construction to infrastructure see the Hyderabad Incremental Development Scheme, Siddiqui, T.A., 1987.

11. There is evidence to support the adoption of this range. Pakistan's household income and expenditure survey for example, suggests 8% (rural) to 17% (urban) of total household expenditures are in housing. (GOP, Household Income and Expenditure Surveys, 1984-85 also cited in Malik S.J. 1987). In practice, the percentage adopted should be derived from site-specific studies of the target group's current housing payments.

12. In Canada, as in the South it is not uncommon to increase the sale price of a house between the original offer and sale agreement and final delivery, when costs exceed initial estimates. An alternative would be to include a contingency amount over initial estimate in the sale price which is returned if costs do not exceed these estimates. The surplus could reflect this contingency.

13. Only the first module of the affordability model is described and used here. It is however, the most basic component and establishes the essential design parameters necessary to achieve affordability. Subsequent modules cover such aspects as cash-flow and construction planning over the life cycle of the project. For a full description see World Bank/PADCO 1986.

14. Affordability could also be enhanced by extending the repayment period from the present 15 years to (say) 35 years. However, the experience in Pakistan, and in the South in general, has been that extending repayment periods substantially beyond what low-income groups are used to from borrowings in the informal credit markets (typically 1 to 10 years), as previously mentioned, increases the likelihood of defaults and weakens the

collection capability and will of the collecting institution. In some contexts, such as Canada, longer repayment periods may be appropriate.

15. A marla is a basic measure of land area. One marla is approximately 24 m2.

16. This percentage of circulation and open space is still significantly higher than in the informal settlements in which the target population currently live. With creative design and the more efficient sharing of uses- such as between schools and the community for park spaces - little if any loss of quality is experienced. In fact, as observed, larger percentages tend to result in underutilised and unmaintained spaces. In Canada, to the extent that leisure and recreation is more formally organised and municipalities are more able to maintain public spaces, this may be less of a problem and proportionally larger allocations more justifiable.

17. A more detailed evaluation of the new GOP standards is required than was possible in this paper.

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APPENDICES

AFFORDABILITY MODEL SPREADSHEETS 1 TO 6

SHEET 1: SURJANI PROJECT. AS DESIGNED USING BELOW MARKET LAND PRICES

I - LAND AND DEVELOPMENT COSTS		Base cost /m2	Percentages Physic. Conting	Design Sup.Mg	Inter. Constru	*TO BE RECOVERED $/m2	
Land	cost/gross m2	22.85	0.00	0.00	0.00	22.85	
Site preparat.	" /m2	0.53	0.00	0.00	0.00	0.53	
On-site infrast.	" /m2	20.67	0.00	0.00	0.00	20.67	
Off-site infrast.	" /m2	22.55	0.00	0.00	0.00	22.55	
Other developmt	" /m2	0.00	0.00	0.00	0.00	0.00	CONSTRUC.
CONSTRUCTION COST	Area m2						*COST/UNIT
Superst. Unit #1	0.00	0.00	0.00	0.00	0.00	#1	0
" Unit #2	0.00	0.00	(Same % as unit #1)			#2	0
" Unit #3	0.00	0.00	"	"	"	#3	0
" Unit #4	0.00	0.00	"	"	"	#4	0
" Unit #5	0.00	0.00	"	"	"	#5	0
" Unit #6	0.00	0.00	"	"	"	#6	0

*DEVELOPED LAND COST/GROSS m2 TO RECOVER TO BREAK EVEN : 66.60

II - LAND USE & PRICING OF NON-RESIDENTIAL LAND

		*PERCENT	Non-Residential	
Total area in ha	139.00	100.00 %	Devel. land price	
Circulation in %	36.44	50.65 ha	per net m2	
Open Space in %	6.50	9.03 ha	----------	
Primary schools m2	10900	0.78 %	0.00	
Second. schools m2	20000	1.44 %	0.00	
Other facilities m2	20000	1.44 %	0.00	
Commercial #1 m2	111500	8.02 %	221.00	
Commercial #2 m2	0	0.00 %	0.00	
Commercial #3 m2	0	0.00 %	0.00	
Small industry m2	0	0.00 %	0.00	
*TOTAL MARKETABLE m2	793134	57.06 %		
*TOTAL RESID.AREA m2	630734	45.38 %		
*TOTAL NUMB.OF PLOTS	4517	PlotS/ha:	32	Hshd size : 7
*POPULAT. DENSITY/ha	211			

*DEVELOPED LAND COST/NET m2 TO RECOVER TO BREAK EVEN :116.72

III - PRICING & AFFORDABILITY OF RESIDENTIAL PLOTS

	#1	#2	#3	#4	#5	#6	#7
Resid. plot types							
Month. income/hshd	700	820	910	1324	0	0	0
Plot size in m2	70.00	104.00	198.00	336.00	4000.00	0.00	0.00
Plot/type percent.	52.00	22.00	10.00	16.00	0.17	0.00	0.00
*NUMB.OF PLOTS/TYPE	2349	994	452	723	8	0	0
Dev.landprice/netm2	100.00	150.00	200.00	200.00	250.00	0.00	0.00
Superst. cost/plot	30000	30000	30000	30000	0	0	0
Other cost/plot	0	0	0	0	0	0	0
*TOT.CAPITAL COST/H	37000	45600	69600	97200	1000000	0	0
Down paymt percent	20.00	20.00	30.00	40.00	0.00	0.00	0.00
" " lump sum	0	0	0	0	0	0	0
Interest rate/year	8.00	8.00	8.00	8.00	8.00	0.00	0.00
Loan term (years)	15	15	15	15	15	0	0
*MONTH.MORTGAG.PYMT	282.87	348.62	465.59	557.34	9556.52	0.00	0.00
Water&elect.charge	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other month.charges	0.00	0.00	0.00	0.00	0.00	0.00	0.00
*TOTAL MONTH.PAYMENT	282.87	348.62	465.59	557.34	9556.52	0.00	0.00
* %OF MONTHLY INCOME	40.41	42.51	51.16	42.09	N/A	0.00	0.00

IV - COST RECOVERY

*DEVELOPED LAND COST RECOVERABLE PER NET m2 : 164.81
*DEVELOPED LAND COST/NET m2 TO RECOVER TO BREAK EVEN : 116.72
*SURPLUS OR DEFICIT IN MILLIONS AND PERCENT : 38.14 41.20%

NOTES

* indicates outputs

Values in Pakistani Rupees
1$US=Rs17.50 (Dec.1987)

S'SHEET 2: SURJANI PROJECT AS DESIGNED: REDUCING DEVELOPED LAND PRICE

I - LAND AND DEVELOPMENT COSTS		Base cost /m2	Percentages Physic. Conting	Design Sup.Mg	Inter. Constru	*TO BE RECOVERED $/m2	
Land	cost/gross m2	22.85	0.00	0.00	0.00	22.85	
Site preparat.	" /m2	0.53	0.00	0.00	0.00	0.53	
On-site infrast.	" /m2	20.67	0.00	0.00	0.00	20.67	
Off-site infrast.	" /m2	22.55	0.00	0.00	0.00	22.55	
Other developmt	" /m2	0.00	0.00	0.00	0.00	0.00	CONSTRUC.
CONSTRUCTION COST	Area m2						*COST/UNIT
Superst. Unit #1	0.00	0.00	0.00	0.00	0.00	#1	0
" Unit #2	0.00	0.00	(Same % as unit #1)			#2	0
" Unit #3	0.00	0.00	"	"	"	#3	0
" Unit #4	0.00	0.00	"	"	"	#4	0
" Unit #5	0.00	0.00	"	"	"	#5	0
" Unit #6	0.00	0.00	"	"	"	#6	0

*DEVELOPED LAND COST/GROSS m2 TO RECOVER TO BREAK EVEN : 66.60

II - LAND USE & PRICING OF NON-RESIDENTIAL LAND

			*PERCENT	Non-Residential Devel. land price per net m2
Total area in	ha	139.00	100.00 %	
Circulation in	%	36.44	50.65 ha	
Open Space in	%	6.50	9.03 ha	
Primary schools	m2	10900	0.78 %	0.00
Second. schools	m2	20000	1.44 %	0.00
Other facilities	m2	20000	1.44 %	0.00
Commercial #1	m2	111500	8.02 %	221.00
Commercial #2	m2	0	0.00 %	0.00
Commercial #3	m2	0	0.00 %	0.00
Small industry	m2	0	0.00 %	0.00
*TOTAL MARKETABLE	m2	793134	57.06 %	
*TOTAL RESID.AREA	m2	630734	45.38 %	
*TOTAL NUMB.OF PLOTS		4517	Plots/ha: 32	Hshd size : 7
*POPULAT. DENSITY/ha		211		

*DEVELOPED LAND COST/NET m2 TO RECOVER TO BREAK EVEN :116.72

III - PRICING & AFFORDABILITY OF RESIDENTIAL PLOTS

Resid. plot types	#1	#2	#3	#4	#5	#6	#7
Month. income/hshd	700	820	910	1324	0	0	0
Plot size in m2	70.00	104.00	198.00	336.00	4000.00	0.00	0.00
Plot/type percent.	52.00	22.00	10.00	16.00	0.17	0.00	0.00
*NUMB.OF PLOTS/TYPE	2349	994	452	723	8	0	0
Dev.landprice/netm2	30.00	75.00	100.00	175.00	200.00	0.00	0.00
Superst. cost/plot	30000	30000	30000	30000	0	0	0
Other cost/plot	0	0	0	0	0	0	0
*TOT.CAPITAL COST/H	32100	37800	49800	88800	800000	0	0
Down paymt percent	20.00	20.00	30.00	40.00	0.00	0.00	0.00
" " lump sum	0	0	0	0	0	0	0
Interest rate/year	8.00	8.00	8.00	8.00	8.00	0.00	0.00
Loan term (years)	15	15	15	15	15	0	0
*MONTH.MORTGAG.PYMT	245.41	288.99	333.14	509.17	7645.22	0.00	0.00
Water&elect.charge	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other month.charges	0.00	0.00	0.00	0.00	0.00	0.00	0.00
*TOTAL MONTH.PAYMENT	245.41	288.99	333.14	509.17	7645.22	0.00	0.00
* %OF MONTHLY INCOME	35.06	35.24	36.61	38.46	N/A	0.00	0.00

NOTES

* indicates outputs

Values in Pakistani Rupees
1$US=Rs17.5
(Dec.1987)

IV - COST RECOVERY

*DEVELOPED LAND COST RECOVERABLE PER NET m2 : 119.66
*DEVELOPED LAND COST/NET m2 TO RECOVER TO BREAK EVEN : 116.72
*SURPLUS OR DEFICIT IN MILLIONS AND PERCENT : 2.33 2.52%

'SHEET 3: SURJANI PROJECT MADE AFFORDABLE BY REPLACING UNIT WITH CONSTRUCTION LOAN

I - LAND AND DEVELOPMENT COSTS		Base cost /m2	Physic. Conting	Design Sup.Mg	Inter. Constru	*TO BE RECOVERED $/m2	
Land	cost/gross m2	22.85	0.00	0.00	0.00	22.85	
Site preparat.	" /m2	0.53	0.00	0.00	0.00	0.53	
On-site infrast.	" /m2	20.67	0.00	0.00	0.00	20.67	
Off-site infrast.	" /m2	22.55	0.00	0.00	0.00	22.55	
Other developmt	" /m2	0.00	0.00	0.00	0.00	0.00	CONSTRUC.
CONSTRUCTION COST	Area m2						*COST/UNIT
Superst. Unit #1	0.00	0.00	0.00	0.00	0.00	#1	0
" Unit #2	0.00	0.00	(Same % as unit #1)			#2	0
" Unit #3	0.00	0.00	"	"	"	#3	0
" Unit #4	0.00	0.00	"	"	"	#4	0
" Unit #5	0.00	0.00	"	"	"	#5	0
" Unit #6	0.00	0.00	"	"	"	#6	0

*DEVELOPED LAND COST/GROSS m2 TO RECOVER TO BREAK EVEN : 66.60

II - LAND USE & PRICING OF NON-RESIDENTIAL LAND			*PERCENT	Non-Residential
Total area in	ha	139.00	100.00 %	Devel. land price
Circulation in	%	36.44	50.65 ha	per net m2
Open Space in	%	6.50	9.03 ha	
Primary schools	m2	10900	0.78 %	0.00
Second. schools	m2	20000	1.44 %	0.00
Other facilities	m2	20000	1.44 %	0.00
Commercial #1	m2	111500	8.02 %	221.00
Commercial #2	m2	0	0.00 %	0.00
Commercial #3	m2	0	0.00 %	0.00
Small industry	m2	0	0.00 %	0.00
*TOTAL MARKETABLE	m2	793134	57.06 %	
*TOTAL RESID.AREA	m2	630734	45.38 %	
*TOTAL NUMB.OF PLOTS		4517	Plots/ha: 32	Hshd size: 7
*POPULAT. DENSITY/ha		211		

*DEVELOPED LAND COST/NET m2 TO RECOVER TO BREAK EVEN :116.72

III - PRICING & AFFORDABILITY OF RESIDENTIAL PLOTS	#1	#2	#3	#4	#5	#6	#7
Resid. plot types	700	820	910	1324	0	0	0
Month. income/hshd	70.00	104.00	198.00	336.00	4000.00	0.00	0.00
Plot size in m2	52.00	22.00	10.00	16.00	0.17	0.00	0.00
Plot/type percent.	2349	994	452	723	8	0	0
*NUMB.OF PLOTS/TYPE	95.00	100.00	105.00	110.00	250.00	0.00	0.00
Dev.landprice/netm2	10000	10000	10000	10000	0	0	0
Constr.maters. loan	0	0	0	0	0	0	0
Other cost/plot							
*TOT.CAPITAL COST/H	16650	20400	30790	46960	1000000	0	0
Down paymt percent	20.00	20.00	30.00	40.00	0.00	0.00	0.00
" " lump sum	0	0	0	0	0	0	0
Interest rate/year	8.00	8.00	8.00	8.00	8.00	0.00	0.00
Loan term (years)	15	15	15	15	15	0	0
*MONTH.MORTGAG.PYMT	127.29	155.96	205.97	269.26	9556.52	0.00	0.00
Water&elect.charge	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other month.charges	0.00	0.00	0.00	0.00	0.00	0.00	0.00
*TOTAL MONTH.PAYMENT	127.29	155.96	205.97	269.26	9556.52	0.00	0.00
* %OF MONTHLY INCOME	18.18	19.02	22.63	20.34	N/A	0.00	0.00

NOTES

* indicates outputs

Values in Pakistani Rupees
1$US=Rs17.50
(Dec.1987)

IV - COST RECOVERY		
*DEVELOPED LAND COST RECOVERABLE PER NET m2	: 118.99	
*DEVELOPED LAND COST/NET m2 TO RECOVER TO BREAK EVEN	: 116.72	
*SURPLUS OR DEFICIT IN MILLIONS AND PERCENT	: 1.80	1.95%

S'SHEET 4:SCENARIO I. SURJANI PROJECT. USING MARKET PRICES FOR LAND

I - LAND AND DEVELOPMENT COSTS			Base cost /m2	Physic. Conting	Design Sup.Mgm	Inter. Constru	*TO BE RECOVERED $/m2	
				Percentages				
Land	cost/gross m2	200.00	0.00	0.00	0.00	200.00		
Site preparat.	" /m2	0.53	0.00	0.00	0.00	0.53		
On-site infrast.	" /m2	20.67	0.00	0.00	0.00	20.67		
Off-site infrast.	" /m2	22.55	0.00	0.00	0.00	22.55		
Other developmt	" /m2	0.00	0.00	0.00	0.00	0.00	CONSTRUC.	
CONSTRUCTION COST	Area m2						*COST/UNIT	
Superst. Unit #1	0.00	0.00	0.00	0.00	0.00	#1	0	
" Unit #2	0.00	0.00	(Same % as unit #1)			#2	0	
" Unit #3	0.00	0.00	"	"	"	#3	0	
" Unit #4	0.00	0.00	"	"	"	#4	0	
" Unit #5	0.00	0.00	"	"	"	#5	0	
" Unit #6	0.00	0.00	"	"	"	#6	0	

*DEVELOPED LAND COST/GROSS m2 TO RECOVER TO BREAK EVEN : 243.75

II - LAND USE & PRICING OF NON-RESIDENTIAL LAND

			*PERCENT	Non-Residential Devel. land price per net m2
Total area in	ha	139.00	100.00 %	
Circulation in	%	36.44	50.65 ha	
Open Space in	%	6.50	9.03 ha	
Primary schools	m2	10900	0.78 %	0.00
Second. schools	m2	20000	1.44 %	0.00
Other facilities	m2	20000	1.44 %	0.00
Commercial #1	m2	111500	8.02 %	1175.00
Commercial #2	m2	0	0.00 %	0.00
Commercial #3	m2	0	0.00 %	0.00
Small industry	m2	0	0.00 %	0.00
*TOTAL MARKETABLE	m2	793134	57.06 %	
*TOTAL RESID.AREA	m2	630734	45.38 %	
*TOTAL NUMB.OF PLOTS		2175	Plots/ha: 16	Hshd size : 7
*POPULAT. DENSITY/ha		102		

*DEVELOPED LAND COST/NET m2 TO RECOVER TO BREAK EVEN : 427.18

III - PRICING & AFFORDABILITY OF RESIDENTIAL PLOTS

Resid. plot types	#1	#2	#3	#4	#5	#6	#7
Month. income/hshd	700	850	1000	1324	0	0	0
Plot size in m2	70.00	104.00	198.00	336.00	4000	0.00	0.00
Plot/type percent.	48.00	22.00	10.00	16.00	4.00	0.00	0.00
*NUMB.OF PLOTS/TYPE	1044	478	217	348	87	0	0
Dev.landprice/netm2	120.00	125.00	130.00	135.00	500.00	0.00	0.00
Consts./maters loan	10000	10000	10000	10000	0	0	0
Other cost/plot	0	0	0	0	0	0	0
*TOT.CAPITAL COST/H	18400	23000	35740	55360	2000000	0	0
Down paymt percent	20.00	20.00	30.00	40.00	0.00	0.00	0.00
" " lump sum					0	0	0
Interest rate/year	8.00	8.00	8.00	8.00	8.00	0.00	0.00
Loan term (years)	15	15	15	15	15	0	0
*MONTH.MORTGAG.PYMT	140.67	175.84	239.09	317.43	19113	0.00	0.00
Water&elect.charge	0.00	0.00	0.00	0.00	0	0.00	0.00
Other month.charges	0.00	0.00	0.00	0.00	0	0.00	0.00
*TOTAL MONTH.PAYMENT	140.67	175.84	239.09	317.43	19113	0.00	0.00
* %OF MONTHLY INCOME	20.10	20.69	23.91	23.98	N/A	0.00	0.00

NOTES

* indicates outputs

Values in Pakistani Rupees
1US$=Rs17.5
(Dec.1987)

IV - COST RECOVERY

*DEVELOPED LAND COST RECOVERABLE PER NET m2 : 430.38
*DEVELOPED LAND COST/NET m2 TO RECOVER TO BREAK EVEN : 427.18
*SURPLUS OR DEFICIT IN MILLIONS AND PERCENT : 2.54 0.75%

S'SHEET 5:SCENARIO II, SURJANI PROJECT. USING GOP'S NEW PLANNING STANDARDS.

I - LAND AND DEVELOPMENT COSTS			Base cost /m2	Physic.al Contingen	Design Sup.Mgm	Inter. Constru	*TO BE RECOVERED $/m2	
Land	cost/gross m2		200.00	0.00	0.00	0.00	200.00	
Site preparat.	" /m2		0.53	0.00	0.00	0.00	0.53	
On-site infrast.	" /m2		20.67	0.00	0.00	0.00	20.67	
Off-site infrast.	" /m2		22.55	0.00	0.00	0.00	22.55	
Other developmt	" /m2		0.00	0.00	0.00	0.00	0.00	CONSTRUC.
CONSTRUCTION COST	Area m2							*COST/UNIT
Superst. Unit #1		0.00	0.00	0.00	0.00	0.00	#1	0
" Unit #2		0.00	0.00	(Same % as unit #1)			#2	0
" Unit #3		0.00	0.00	"	"	"	#3	0
" Unit #4		0.00	0.00	"	"	"	#4	0
" Unit #5		0.00	0.00	"	"	"	#5	0
" Unit #6		0.00	0.00	"	"	"	#6	0

*DEVELOPED LAND COST/GROSS m2 TO RECOVER TO BREAK EVEN : 243.75

II - LAND USE & PRICING OF NON-RESIDENTIAL LAND

		*PERCENT		Non-Residential Devel. land price per net m2
Total area in ha	139.00	100.00	%	
Circulation in %	25.00	34.75	ha	
Open Space in %	5.00	6.95	ha	
All comty facs. m2	139000	10.00	%	0.00
(Ed.,Health, etc)	0	0.00	%	0.00
	0	0.00	%	0.00
Commercial #1 m2	41700	3.00	%	1000.00
Commercial #2 m2	0	0.00	%	0.00
Commercial #3 m2	0	0.00	%	0.00
Other facs. m2	0	0.00	%	0.00
*TOTAL MARKETABLE m2	973000	70.00	%	
*TOTAL RESID.AREA m2	792300	57.00	%	
*TOTAL NUMB.OF PLOTS	2961		Plots/ha:	21 Hshd size : 7
*POPULAT. DENSITY/ha	138			

*DEVELOPED LAND COST/NET m2 TO RECOVER TO BREAK EVEN : 348.21

III - PRICING & AFFORDABILITY OF RESIDENTIAL PLOTS

Resid. plot types	#1	#2	#3	#4	#5	#6	7
Month. income/hshd	850	1000	1500	3000	6000	0	0
Plot size in m2	72.00	105.00	160.00	250.00	500.00	0.00	0.00
Plot/type percent.	15.00	15.00	10.00	30.00	30.00	0.00	0.00
*NUMB.OF PLOTS/TYPE	444	444	296	888	888	0	0
Dev.landprice/netm2	190.00	200.00	250.00	400.00	410.00	0.00	0.00
Constr/maters loan	10000	10000	10000	10000	10000	0	0
Other cost/plot	0	0	0	0	0	0	0
*TOT.CAPITAL COST/H	23680	31000	50000	110000	215000	0	0
Down paymt percent	20.00	20.00	30.00	40.00	0.00	0.00	0.00
" " lump sum					0	0	0
Interest rate/year	8.00	8.00	8.00	8.00	8.00	0.00	0.00
Loan term (years)	15	15	15	15	15	0	0
*MONTH.MORTGAG.PYMT	181.04	237.00	334.48	630.73	2054.65	0.00	0.00
Water&elect.charge	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other month.charges	0.00	0.00	0.00	0.00	0.00	0.00	0.00
*TOTAL MONTH.PAYMENT	181.04	237.00	334.48	630.73	2054.65	0.00	0.00
* %OF MONTHLY INCOME	21.30	23.70	22.30	21.02	34.24	0.00	0.00

NOTES

* indicates outputs

Values in Pakistani Rupees
1US$=Rs17.5
(Dec.1987)

IV - COST RECOVERY

*DEVELOPED LAND COST RECOVERABLE PER NET m2 : 349.34
*DEVELOPED LAND COST/NET m2 TO RECOVER TO BREAK EVEN : 348.21
*SURPLUS OR DEFICIT IN MILLIONS AND PERCENT : 1.10 0.32%

SHEET 6: SCEN.III. SURJANI PROJ. MORE EFFECTIVE STANDARDS, PRICING AND FINANCING SYS.

I - LAND AND DEVELOPMENT COSTS		Base cost /m2	Physic. Conting	Design Sup.Mg	Inter. Constr	*TO BE RECOVERED $/m2	
			Percentages				
Land	cost/gross m2	200.00	0.00	0.00	0.00	200.00	
Site preparat.	" /m2	0.53	0.00	0.00	0.00	0.53	
On-site infrast.	" /m2	20.67	0.00	0.00	0.00	20.67	
Off-site infrast.	" /m2	22.55	0.00	0.00	0.00	22.55	
Other developmt	" /m2	0.00	0.00	0.00	0.00	0.00	CONSTRUC.
CONSTRUCTION COST	Area m2						*COST/UNIT
Superst. Unit #1	0.00	0.00	0.00	0.00	0.00	#1	0
" Unit #2	0.00	0.00	(Same % as unit #1)			#2	0
" Unit #3	0.00	0.00	"	"	"	#3	0
" Unit #4	0.00	0.00	"	"	"	#4	0
" Unit #5	0.00	0.00	"	"	"	#5	0
" Unit #6	0.00	0.00	"	"	"	#6	0

*DEVELOPED LAND COST/GROSS m2 TO RECOVER TO BREAK EVEN : 243.75

II - LAND USE & PRICING OF NON-RESIDENTIAL LAND		*PERCENT	Non-Residential Devel. land price per net m2
Total area in ha	139.00	100.00 %	
Circulation in %	15.00	20.85 ha	
Open Space in %	5.00	6.95 ha	
All comty facs. m2	111200	8.00 %	0.00
(Ed.,Health, etc)	0	0.00 %	0.00
	0	0.00 %	0.00
Commercial facs.m2	111500	8.02 %	700.00
Commercial #2 m2	0	0.00 %	0.00
Commercial #3 m2	0	0.00 %	0.00
Other facilities m2	0	0.00 %	0.00
*TOTAL MARKETABLE m2	1112000	80.00 %	
*TOTAL RESID.AREA m2	889300	63.98 %	
*TOTAL NUMB.OF PLOTS	5256	Plots/ha:	38 Hshd size: 7
*POPULAT. DENSITY/ha	246		

*DEVELOPED LAND COST/NET m2 TO RECOVER TO BREAK EVEN : 304.69

III - PRICING & AFFORDABILITY OF RESIDENTIAL PLOTS							
Resid. plot types	#1	#2	#3	#4	#5	#6	#7
Month. income/hshd	700	850	1000	1500	3000	6000	0
Plot size in m2	50.00	72.00	105.00	160.00	250.00	500.00	0.00
Plot/type percent.	5.00	45.00	12.00	12.00	11.00	15.00	0.00
*NUMB.OF PLOTS/TYPE	263	2365	631	631	578	788	0
Dev.landprice/netm2	100.00	140.00	150.00	180.00	350.00	400.00	0.00
con+mat loan	10000	10000	10000	10000			0
Other cost/plot	0	0	0	0	0	0	0
*TOT.CAPITAL COST/H	15000	20080	25750	38800	87500	200000	0
Down paymt percent	20.00	20.00	25.00	25.00	30.00	30.00	0.00
" " lump sum							0
Interest rate/year	12.00	12.00	12.00	12.00	12.00	12.00	0.00
Loan term (years)	15	15	15	15	15	15	0
*MONTH.MORTGAG.PYMT	144.02	192.79	231.78	349.25	735.10	1680.24	0.00
Water&elect.charge	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other month.charges	0.00	0.00	0.00	0.00	0.00	0.00	0.00
*TOTAL MONTH.PAYMENT	144.02	192.79	231.78	349.25	735.10	1680.24	0.00
* %OF MONTHLY INCOME	20.57	22.68	23.18	23.28	24.50	28.00	0.00

NOTES

* indicates outputs

Values in Pakistani Rupees

1US$=Rs17.50 (Dec.1987)

IV - COST RECOVERY	
*DEVELOPED LAND COST RECOVERABLE PER NET m2 :	305.37
*DEVELOPED LAND COST/NET m2 TO RECOVER TO BREAK EVEN :	304.69
*SURPLUS OR DEFICIT IN MILLIONS AND PERCENT :	0.76 0.22%

NOTE ON THE AUTHOR

Dr. Farokh Afshar is an associate professor of International Development Planning at the University School of Rural Planning and Development, University of Guelph, Canada. He is also a director of Development Workshop, a non-profit organisation that offers technical assistance in housing, settlement, and regional planning. Dr. Afshar received his doctorate in urban and regional planning from the Massachusetts Institute of Technology. He has sixteen years of experience in research, teaching and professional practice, largely in Asia and the Middle East but also in the U.K., U.S.A. and Canada. He has worked in private practice as well as for governments and international agencies such as the World Bank. Recent activities include being a team member of the World Bank Pakistan Shelter Sector Review and assisting the Aga Khan Organization, an international NGO, in its rural housing and settlement programs in India and Pakistan. His most recent publication is a chapter titled "Inequalities, Western Roots, and Implementation Problems: Three Challenges to a One-World Planning Education" in Sanyal, B. (Editor) (1990) Breaking the Boundaries: A One World Approach to Planning Education, U.K., Plenum.