Innstad New Town[1]

The government of Santa Cruz, a large independent island of the coast of Latin America, wants to diversify its economy, still largely dependent on sugar cane and tropical fruit. Taking advantage of the recent discovery of a large deposit of bauxite in the north, it has decided to build an industrial new town based on the production of aluminum some of which will be exported and some used in a new automobile assembly plant that will be built as a joint venture with Fiat. The coach work will be built in Santa Cruz and assembled on imported chassis and engines, and most of the cars will be exported to other countries in the Western Hemisphere. With the addition of smaller scale complementary industries, some 50 hectares of industrial land will be developed:

Aluminum Works:	10 ha.	640 workers
Fiat/Santa Cruz:	15 ha.	720 workers
Light industries:	25 ha.	2,180 workers

It is estimated that an additional 2,500 service jobs will be generated by the basic employment in the industries.

The New Town Site

The capital city, also called Santa Cruz, is located around an inlet penetrating a narrow coastal strip surrounded by steep hills. The recent rapid expansion of its population, which has just passed the one million mark, has preempted almost all readily buildable land around the capital. It has therefore been decided to build the new town in an agricultural area lying some 15 kilometers to the north west of Santa Cruz, just beyond the range of hills surrounding the capital. In spite of its rolling terrain, the site is about as flat as any to be found in an island whose varied and often spectacular topography has contributed to the relative isolation of its agricultural and fishing villages. A preliminary agreement has been negotiated with the World Bank to secure a 15 year loan at 9.5%.

The area within which the new town of Innstad is to be located is sparsely settled. Several sugar cane plantations offer seasonal employment to about 450 workers, the farmers and their families who live on small holdings, scattered about the countryside. The hilly portions of the site are heavily wooded while the plain is generally devoid of tree cover. Two small fishing villages are located on the coast. An important reason for the selection of this area is the presence of two aquifers which can be tapped to provide drinking water.

A preliminary estimate of the necessary land take of 500 hectares indicates that considerable latitude exists in choosing a site for Innstad. Yet, the topography of the area, its proximity to the seashore, and the necessity for the government to expropriate the land for the project require a careful

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[1] Prepared by François Vigier.

evaluation of the environmental as well as financial implications of the development strategy. A preliminary agreement has been negotiated with the World Bank to secure a 15 year loan at 9.5%.

You have been asked to (1) locate the new town; (2) determine its spatial structure; (3) program its development over ten years; and (4) assess the feasibility of undertaking its construction.

Project Description

Characteristics of the population

Preliminary studies have determined that, given the mix of industries proposed, some 5,200 households are expected to settle in Innstad. Housing, community facilities and shops will have to be built for nearly 20,000 people, little in this rural environment being worth using. Even though industrial wages will be generally higher than in the capital, it is expected that as many as 50% of households with lower incomes will require some form of housing assistance while less than 20% will earn enough to afford market-rate housing. Housing affordability will certainly become and issue and the government is concerned that subsidies be kept to a minimum consistent with the "image" of the first industrial new town in the country.

Given the age distribution in Santa Cruz, nearly a third of the population will be of school age. On the other hand, household sizes will be lower than in the country as a whole, a reflection of the younger age and higher education and skills of industrial workers. Tables 1 - 3 summarize the expected distribution of households, by income and size, their expenditure patterns and their theoretical ability to pay for housing.

Table 1.

Number of Households by Annual Income and Size

Lower Bound of Income Group	Household Size 1	2	3	4	5	6	7	8 +
< 2900	213	260	88	104	68	96	58	38
3480	328	406	146	156	135	182	109	54
4640	125	156	68	68	68	86	51	34
5800	57	78	47	47	47	57	34	23
6960	114	203	172	156	146	107	64	27
9280	21	57	47	47	36	1	1	1
11600	36	125	88	88	68	83	17	6
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

Median Income = 4923 Median Family Size = 3.6

Table 2.

Annual Household Expenditure Patterns

Expenditures	Household Size 1	2	3	4	5	6	7	8 +
Food	591	665	832	979	1061	1103	1149	1301
Clothing	175	1[illegible]	254	287	306	315	325	340
Transport	288	470	552	624	635	601	625	650
Other	495	990	1115	947	937	964	928	875

Table 3.

Ability to Pay for Housing by Annual Household Income and Size

Lower Bound of Income Group	Household Size							
	1	2	3	4	5	6	7	8 +
< 2900	137	72	36	29	21	17	14	2
3480	209	145	109	102	93	90	86	74
4640	306	241	206	199	190	186	183	171
5800	403	338	302	295	287	283	279	268
6960	548	483	447	440	432	428	424	413
9280	741	676	641	634	625	621	618	606
11600	838	773	737	730	722	718	714	703
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

Housing Standards

Three housing types are being considered: high density one- and two-story row houses of 20 m^2 to 75 m^2 on 75 m^2 lots (Type "A"); medium density detached houses of 35 m^2 to 55 m^2 on 200 m^2 sites (Type "B"); and low density detached units of 50 m^2 to 90 m^2 on 500 m^2 sites (Type "C").[2] This housing typology is prevalent in Santa Cruz where high construction costs and a benign climate encourage outdoor life. Table 4 lists housing occupancy standards.

[2] Types "A", "B", and "C" refer to the Innstad.ref database in PROJECT.

Table 4.

Minimum Space Consumption Standard (m2/person) :	Lo	Md	Hi
1- and 2-person households :	12	12	15
3- and 4-person households :	10	12	10
5- and 6-person households :	8	8	10
7+ person households :	8	8	10

Housing Financing

Under current national housing policy, households with incomes of less than U7,000 are eligible for subsidized interest loans. Low-income households earning less than U4,600 are required to make a down payment of 5% of the unit's cost to obtain 25 year financing at 3.5% interest. Eligible moderate income households make a 10% down payment for a 25 year mortgage at 5.5%.
Market rate home financing requires a 20% down payment and 9.5% interest on a 25 year mortgage.

Off-site Infrastructure

The construction of the new town will require substantial public investment to connect it to Santa Cruz and its port to the southeast and to the bauxite deposits to the north. The selection of the final site will therefore require a careful weighing of the off-site investments, the land acquisition and the on-site infrastructure costs.

Road improvements. The main paved road through the area, the North Road, runs from Santa Cruz to the bauxite deposits in the northern part of the island. It will have to be widened and improved to carry the trucking in of ore and provide adequate access to the capital city and its port. Its reconstruction to a 10 meter, heavy duty paved road in a 20 meter right of way will cost U200,000 per kilometer.[4] A connection between the New Town and the Central Highway may also have to be provided.

Electrical connections. Connecting the site to the national 66 kilo-volt (KV) grid and stepping down the voltage to 11 KV will cost U500,000.

[4] The local currency, the unidos, is worth slightly less than the US dollar.

Primary infrastructure

Water supply. Water consumption for the new town has been estimated at 5,000,000 liters per day (5.0 MLD) for residential consumption, 1.0 MLD for commercial and institutional uses, and 20 MLD for the industries. The cost of tapping the aquifers, installing pumps and chlorination is U150,000 for a well capable of delivering 8.6 MLD. The 200 millimeter mains cost U60 per running meter, installed.

Sewage treatment. Treatment will have to be provided for 21.0 MLD. Industrial effluent will have been partially treated and can be discharged in the city sewers. Two treatment options are under consideration:

A. Stabilization pond. Stabilization is a natural way of treating sewage. By detaining raw effluent in a series of shallow ponds for two to four weeks, depending on temperature conditions, a significant level of both biochemical oxygen demand (BOD) and pathogen removal can be achieved: the natural action of warmth and sunlight promotes the rapid growth of micro-organisms which remove BOD both aerobically and anaerobically. This solution requires a 25 hectare site, but its capital cost is only U750,000 and its operating cost of U25,000 per annum is quite low.

B. Sewage purification plant. This more standard solution requires a 3 hectare site for a U4,500,000 plant with an annual operating cost of U500,000.

In both instances, the 500mm mains feeding the treatment system and discharging the effluent into the sea will cost U250 per running meter. Should pumping of sewage be required, an additional capital cost of U50,000 and an annual operations and maintenance charge of U7,500 will be incurred per MLD pumped.

Electrical network. Primary distribution will take place through an 11 KV grid running directly to the industries and major subareas of the town where it will be stepped down to 440 volts at a cost of U50,000 per kilometer.

Primary roads. U150,000 per kilometer for a 10 meter wide asphalt road.

Secondary infrastructure

Residential costs, comprising distributor roads and electricity, water, sewer, and local streets will vary according to the mix of housing types. Given prototypical layouts, they have been estimated at U225,000/ha. for Type "A", U174,000/ha. for Type "B" and U192,000/ha. for Type "C". For non-residential uses, they are: U247,000/ha. for commerce; U70,000/ha. for industry; and U35,000/ha. for community facilities.

Land Costs

Current land costs are shown on the attached map and reflect both the utilization of land and demand. It is expected that the construction of the new town will have a significant effect on future land values.

Economic trends

The economy of Santa Cruz has been remarkably stable over the past few years, a trend that government planners expect to continue over the next few years. Inflation has been running at less than 5% per annum while household incomes have grown by 5.5%. The construction cost index has grown slightly faster, at an annual rate of 7.5% for heavy construction and 6.5% for housing.

PROJECT innstad.ref and innstad.dta Database

PROJECT CHARACTERISTICS

Project Phasing

Phase One (years):	1	Phase Two (years):	1
Phase Three (years):	1		

Area Purchased

Phase One:	0	Phase Two:	0
Phase Three:	0		

Area Serviced with Primary Infrastructure

Phase One:	0	Phase Two:	0
Phase Three:	0		

Project Population - Number of Households

Low-Income Hslds):	2445	Middle-Income Hslds):	1540
High-Income Hslds):	1215		

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SOCIO-ECONOMIC CHARACTERISTICS

Existing Population - Number of Households

Low Income:	425	Middle Income:	92
High Income:	12		

Existing Population - Average Household Size

Low Income:	6.50	Middle Income:	6.00
High Income:	5.50		

Existing Population - Average Household Income

Low Income:	2850	Middle Income:	3575
High Income:	14550		

Project Population - Average Household Size

Low Income:	3.36	Middle Income:	3.75
High Income:	3.56		

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SOCIO-ECONOMIC CHARACTERISTICS (CONTINUED)

Project Population - Average Annual Household Income

Low Income Households:	3260	Middle Income Households:	5990
High Income Households:	10925		

Percent School Age Population: 22.50
Net Rate of Population Increase: 1.75

HOUSEHOLD HOUSING EXPENDITURES

Monthly Payment (% of Disposable Income)

Low Income Households:	25.00	Middle Income Households:	25.00
High Income Households:	27.50		

HOUSING FINANCING TERMS

Down Payment (% of annual household income)

Low Income Households:	50.00	Middle Income Households:	50.00
High Income Households:	75.00		

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HOUSEHOLD FINANCING TERMS (CONTINUED)

Mortgage Life (years)

Low Income Households:	25	Middle Income Households:	25
High Income Households:	25		

Mortgage Interest Rate

Low Income Households:	3.50	Middle Income Households:	5.50
High Income Households:	9.50		

Proposed Housing Subsidy Budget [millions]

Phase One:	0	Phase Two:	0
Phase Three:	0		

HOUSING CHARACTERISTICS

Density (land area per dwelling)

Type "A":	0.0077	Type "B":	0.0209
Type "C":	0.0529	Type "D":	0.0000

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HOUSING CHARACTERISTICS (CONTINUED)

Cost per Dwelling (exclusive of land)

Type "A":	6667	Type "B":	11250
Type "C":	20500	Type "D":	0

Secondary Infrastructure (per area of land developed)

Type "A":	225000	Type "B":	174000
Type "C":	192000	Type "D":	0

OTHER DEVELOPMENT STANDARDS

Land Consumption

Industry - Phase One:	0	Industry - Phase Two:	0
Industry - Phase Three:	0	Commerce (per household):	0.0015
Schools (per pupil):	0.0020	Other (per household):	0.0005

Secondary Infrastructure Costs

Commerce:	247000	Industry:	70000
Community Facilities:	35000		

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SITE DEVELOPMENT COSTS

Land Acquisition (per area of land)

Phase One:	0	Phase Two:	0
Phase Three:	0		

Primary Infrastructure (per area of land developed)

Phase One:	0	Phase Two:	0
Phase Three:	0		

Capital Cost of Community Facilities

Schools (per pupil):	1250	Other (per household):	550

Planned Infrastructure Budget (millions)

Phase One:	0	Phase Two:	0
Phase Three:	0		

Cost Inflators (% per year)

Infrastructure: Phase Two:	7.50	Phase Three:	7.50
Housing: Phase Two:	6.50	Phase Three:	6.50

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PROJECT FINANCING - TRANSFERS

Capital Transfers (% of cost)

Land Acquisition:	0.00	Infrastructure:	0.00
Community Facilities:	0.00		

Operations and Maintenance Transfers (% of annual O & M cost)

Infrastructure:	25.00	Community Facilities:	45.00

PROJECT FINANCING - BORROWING TERMS

Capital Costs

Life of Loan:	15	Interest Rate:	9.00

Housing Subsidy

Life of Loan:	15	Interest Rate:	9.00

ANNUAL PROJECT OPERATING COSTS (% of capital costs)

Infrastructure:	4.00	Community Facilities:	8.00
Planning & Management:	5.00		

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LAND PRODUCTION COST INFLATORS

Residential Uses

Type "A":	1.00	Type "B":	1.00
Type "C":	1.00	Type "D":	1.00

Non-residential Uses

Commercial:	1.00	Industrial:	1.00
Community Facilities:	1.00		

OTHER FINANCIAL INDICATORS

Annual Tax Rate (%):	
Residential Uses:	3.50
Non-residential Uses:	3.50
Amortization Period (years):	20
Opportunity Cost of Capital (%):	8.00
Rate of Increase of Household Incomes (%):	6.50

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