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His research master pieces include the discovery of 1,020 Bangkok slums (1985), computer-assisterd mass appraisal modeling (1990), forecasting of 300,000 unoccupied housing units (1995 and 1998), study for property information centre (2000), roadmap for valuation, Ministry of Finance, Vietnam (2006), Ministry of Finance, Indonesia (2008), World Bank Indonesia (2010), Ministry of Finance, Cambodia (2012), UN World Cities (2015), ASEAN Property Surveys (2017), Global Municipal (2017), and Bangkok Zoo relocation (2019).

SUSTAINABLE SOLUTION FOR SQUATTER SETTLEMENTS BY VALUATION APPROACHES

This study proposes alternative solutions for housing squatters in Kathmandu by the body of knowledge of property valuation. It is proved that a slum house is worth a substantial amount of money if an authority compensates them adequately also with removal costs, they would be willing to move away. The site of a squatter settlement can alternatively be used for other activities such as educational institutions, public parks with urban farming or other real estate developments for cost recovery and for well-planned zoning of the city.

Kathmandu as another metropolis in development possesses a lot of slums and squatter settlements. The number of slum dwellers has been increased substantially in the past years. In this paper, it is an attempt to solve the slum problem sustainable.

1. Income Approach to Value

For the financial analysis, the Income Approach to Value is used. According to Investopia <1> "the income approach is a type of real estate appraisal method that allows investors to estimate the value of a property based on the income the property generates. It's used by taking the net operating income (NOI) of the rent collected and dividing it by the capitalization rate".

The capitalization rate is "used in the world of commercial real estate to indicate the rate of return that is expected to be generated on a real estate investment property. This measure is computed based on the net income that the property is expected to generate and is calculated by dividing net operating income by property asset value and is expressed as a percentage. It is used to estimate the investor's potential return on their investment in the real estate market".

Value = Net Operating Income / Capitalization Rate.

For Example, if a slum housing unit (a room) is rented at a net rent (net operating income – excluding expenses) of 4,000 rupees per month and if the capitalization rate is the government bond of 8.5%.

The value would be
= 4,000 rupee per month x 12 months / 8.5%
= 564,706 rupee.

However, the existence of a slum might be insecure. There is an insured land tenure. For example, it is assumed that a slum would last for a period of 20 years (some might be there for so long time). Hence, the risk per year is 5% (where 100% is for 20 years). In

this case, the capitalization rate would be 13.5% (government bond 8.5% plus risk of 5% per annum). The value would be down for

= 4,000 rupee per month x 12 months / 13.5% or = 555,556 rupee.

Likewise, in the case of the value of a housing unit or a development project, it consists of hard costs and soft costs. Hard costs are land and buildings as well as improvements; whereas, soft costs include management fees, interest, taxes, net profit, and the like. Soft costs tend to be some 20-40% depending on the type and size of the project. The rest is for those soft costs.

2. Valuation of a Slum House

In order to make any decision to tackle the problem of slum and squatter settlements in Kathmandu, a valuation of a slum house must be conducted. It is a challenge to value a slum house in Kathmandu. The approach is the Income Approach to Value.

According to our thorough surveys of many slums, we estimate that the potential monthly rent of a slum house is 4,500 rupees per month (Line 4). Actually, a room in a house would be rented for 2,000 – 4,000 rupees. Therefore, 4,500 rupees is estimated to be an ample monthly rent. This would also be considered the net rent with no further expenses on renting the unit. *(Table 1)*

The capitalization rate to convert rent to value is estimated at 8.5% <2> (Line 5) The reliable rate should be the government bond rate. This figure is an average government bond rate. Deposit or lending rates of commercial banks are not used because they are somewhat less reliable and might be distorted in this context. In addition, any lending rate also includes the cost of management and risk premium.

Therefore, the value of a slum house is estimated at 635,294 rupees (Line 6) where the income (a monthly rent, 4,500 rupees multiplied by 12 months and divided by 8.5% It should be noted that this is a value of a perpetual period. No risk of eviction is considered. It is believed that if an authority compensates them at this amount, they would be willing to move away from their current location. Perhaps, they might move back to their homes upcountry. However, the authority must not allow them to settle down in another slum. Otherwise, the problem would be recurring.

A	B	C	D
2	**Table 1: Actual Value of A Slum House**		
3	Item	Figure	Remarks
4	Potential monthly rent (Rupee)	4,500	Estimated
5	Capitalization Rate (Govt Bond)	8.50%	https://bit.ly/3ROUhwm
6	Value of a slum house (Rupee)	635,294	=C4*12/C5
7	With risk of eviction	5%	Possible stay 20 years
8	Adjusted capitalization rate	13.50%	=C5+C7
9	Forced sale value of a slum house (Rupee)	400,000	=C4*12/C8
10	% of forces sale/market value	63%	=C9/C6
11	Monthly Apartment rent in the city (1 room)	15,831	https://bit.ly/3xg9z3Q
12	Value of a small apartment unit (Rupee)	2,234,994	=C11*12/C5
13	% of a slum house value to an apartment	28%	=C6/C12

However, with the risk or threat of eviction, the value could be less than 635,294 rupee to be only 400,000 rupee. It is assumed that a squatter settlement might last for only 20 years; whereas some might be in existence for over 40 years or more. However, currently, the authorities might try a lot to evict them.

Therefore, it is our opinion that the potential life of a slum might be 20 years. As a result, the risk is 5% per annum (100% is for 20 years). Then the capitalization rate would increase to 13.5% (8.5% + 5.0%). This brings the value of a slum house down to 400,000 rupees (4,500 x 12 / 13.5%) or some 63% of the value appraised earlier (Line 10). If the expected life of a slum is estimated to be only 15 years, the value might become 356,044 rupees or 56% of the original value appraised. It is also believed that this amount of 356,044 to 400,000 rupees would still be attractive for slum dwellers to move away from the site.

Currently, the minimum wage in Nepal is 15,000 rupees <3>. This implies that the slum house price of 635,294 rupees is some 42 months of the minimum wage. It would be 24 months of the wage in the case of the price at 356,044 or 27 months of the wage in the case of the price at 400,000 rupees. If a slum dweller earns this amount of money (24 to 42 months of the minimum wage), they may be willing to move away from the site. The authority may add some more money such as some other 100,000 rupees for removal costs.

3. Compensation for the Dwellers

On one hand, dwellers in a squatter settlement illegally occupy land, they should not be compensated for relocation. They have been staying there for free for years. On the other hand, they should be compensated to ease the relocation process. Basically, there are certain costs to move away from their properties, costs for alternative housing, additional costs of traveling, and the like. Hence, compensation is needed. *(Table 2)*

In this case, it is assumed to relocate a squatter settlement of 126 housing units on a piece of land of 104 anna (6.5 ropani). It is located in Jadibutti Suburb beside the Manohara River in Kathmandu. It is estimated there are approximately 126 housing units (a room or two per unit). Since a slum house is valued at 635,294 rupees, the compensation to 126 housing units is 80,086,500 rupees. The estimated land area for this settlement is around 104 anna or 6.5 ropani. Therefore, the land value per anna here is 770,063 rupees.

Subdivided plots adjacent to this settlement are sold at a market value between 6.0 to 6.5 million rupees per anna. This unsubdivided site (raw land) of this settlement still has no subdivision for some 20% for road and other infrastructure. Therefore, it is

Table 2: The value of slum land compared to market value

Item	Option 1	Option 2	Option 3
A slum house value (rupee)	635,294	400,000	356,044
Estimated No. of housing units		126	
Total compensation (rupee)	80,086,500	50,424,833	44,883,648
Estimated Land area (anna)		104	
Land value per anna	770,063	484,854	431,574
Average market land price/anna		5,000,000	
% of slum land value to the market	15%	10%	9%

estimated to be 5 million rupees per anna (6 million / 120%). Therefore, 770,063 rupee is only 15% of the market value. It is a very reasonable value for an authority to acquire for other developments.

The site can alternatively be used for other activities such as educational institutions, public parks, or other real estate developments for cost recovery and for well-planned zoning of the city. As observed, the site is located near the Tribhuvan International Airport and on Arankiko Highway (H03) which is one of the largest highways in Kathmandu, many supporting activities can utilize this site as well.

4. Alternative Use of the Site: A Public Park

This site can become a public park for local uses. There are some similar parks nearby such as the Apple Ground Public Park Narephat which is located some 1.2 kilometers south of the site of the squatter settlement.

It is estimated that if this squatter settlement is converted to be a public park in a residential area with high density, there might be some 800 visitors of all ages to use the park every day. They came for exercise and recreation which would be good for their health. *(Table 3)*

According to the website of expatistan.com, the price of one month of gym membership in a business district in Kathmandu is 1,979 rupees (see the table). However, the facilities of the park might not be as good as a fitness center. Therefore, the income of this park is estimated to be only 40% of the above fee. This amount of money is considered worthwhile for maintaining good health. Therefore, there will be little risk for illness which needs a lot more cost to cure in the future.

This makes the annual income to the park to be 7,599,360 rupees (800 persons per day, 40% of the 1,979 rupees per month by 12 months). This park could generate this income which must be a lot lower than the cost to cure for illness (if people have no exercise). In addition, there might be some value in relaxation and amusement which is not to be calculated here.

Considering the capitalization rate, normally, it should be the government bond of 8.5% per annum. However, a park is not commercial property and could be very perpetual and sustainable; therefore, the capitalization rate is estimated at 4.25% or half of the government bond rate.

Hence, the value of the park proposed is estimated at 178,808,471 rupees (7,599,360 / 4.25%). The size of the park is 104 anna. The value of the site per anna is thus 1,719,312 million. On the one hand, it is a lot lower than subdivided plots which are sold at 6 million rupees per

A	B	C	D
2	**Table 3: Actual Value of A Slum House**		
3	Item	Figure	Remarks
4	No. of visitors to the park per day	800	Estimated
5	Expenses if no park (rupee per month)	1,979	https://bit.ly/3K1u23Y
6	% of the actual income of the park	40%	Estimated
7	Annual income from the park	7,599,360	=C4*C5*30%*12
8	Capitalization Rate (50% of the govt bond)	4.25%	https://bit.ly/3ROUhwm
9	Value of the park	178,808,471	=C7/C8
10	Size of the park (anna)	104	Estimated
11	Alternative land value per anna	1,719,312	=C9/C10

anna. On the other hand, it is a lot higher than the compensation cost at 770,063 rupees per anna. Therefore, developing a public park on this site is an acceptable alternative land use.

It should be noted that there are costs to build a public park and costs for maintenance as well. They are not included in this simplified model. On the contrary, there are also opportunities for earning some money for the park to organize some activities as well. In addition, this park can imply a new public park concept of urban farming.

Urban farming can be a source of "food production in a community park. Actually, urban dwellers become more aware of the environmental impacts of food production and transportation, as well as the origin and security of what they consume, urban agriculture is bound to grow and attract public and political eyes". <4> It brings food production closer and more sustainable.

5. Relocation of the Squatters to the Vicinity

In the case that the government needs to use this piece of land for other public purposes such as recreation, river expansion, and the like, this whole slum has to be relocated. The following is some exploration of the feasibility.

It must be perfect if these slum dwellers could be relocated to an adjacent area so that there are few negative effects to their normal life. Subsequently they would be willing to move away from the existing squatter settlement. The following table shows a preliminary financial analysis of this scheme. *(Table 4)*

It is assumed that a big piece of land of an adjacent land subdivision project is used for relocation. The proposed site is some 26 anna. Normally, the cost of land is 6 million rupees per anna. However, this is a big

A	B	C	D
2	**Table 4: Value of a Slum Relocation Project**		
3	Item	Figure	Remarks
4	Adjacent land area (in anna)	26	Estimated
5	Cost of land per anna (rupee)	5,000,000	Small plots at 6 mil anna
6	Total land cost	130,000,000	=C4*C5
7	Adjacent land area (in sq.f)	8,899	1 anna = 342.25 sq.f
8	Floor Area Ratio	4	Estimated
9	Buildable area	35,594	=C7*C8
10	% of usable area	85%	Estimated
11	Lettable area (sq.f)	30,255	=C9*C10
12	Cost of construction for low-cost apartment	2,250	(rupee/sq.f)
13	Total cost of construction	68,073,525	=C11*C12
14	Hard costs of the development	198,073,525	=C6+C13
15	% of hard cost to the total value	85%	Estimated
16	Total project value (rupee)	233,027,676	=C14/C15
17	Value per sq.foot (rupee)	7,702	=C16/C11
18	Estimated size of a slum housing unit	240	Estimated in sq.f.
19	Total value of each slum housing unit (rupee)	1,848,515	=C17*C18
20	Total number of housing units constructed	126	=C11/C18
21	Average building coverage area to land	85%	Estmimated
22	Total land area (anna)	104	=C18*C20/C21/342.25

piece of land so it could be 5 million rupees per anna. Hence, the land cost would be 130 million rupees.

The floor area ratio is assumed to be 4:1. Therefore, the buildable area would be 35,594 sq. feet. However, the usable area is estimated to be 85% or 30,255 sq. feet. The cost of construction is 2,250 rupee which is the lowest possible for low-cost housing resulting in the total construction cost of 68,073,525 rupee. When land cost is added, the total hard cost (land and building) is 198,073,525 rupees. There are also some soft costs (e.g. management and the like) of 15%. Therefore, the total value of the scheme is 233,027,676 rupees or 7,702 rupees per sq. feet of usable area.

The estimated size of a slum housing unit is 240 sq. feet. Hence, the total value of each unit is 1,848,515 rupees. This price of housing cannot be found in an open market today. The lowest possible housing units offered in the market might be 3 million rupees. However, the government can get the site of the squatter settlement of 104 anna (6.5 ropani) back at the value of 5 million per anna (compared to adjacent land value – if it is used for conventional residential or commercial uses) or altogether 530 million which is higher than the value of this project of 233 million rupee. It is still worthwhile relocating them to an adjacent area and acquire this piece of land.

6. Conclusions & Recommendations

An observation is that land prices increase substantially in Kathmandu at some 8% - 15%; whereas the minimum wage in Nepal is increased only 6% per annum. Relocated slum dwellers should be educated that if they could legally occupy housing units, their properties would increase in price and could be their savings and investment.

Land of slums and squatter settlements in the inner-city area is considered land in prime location which could be for commercial uses. If the dwellers are compensated at an ample amount, they should be happy to move away. If the government provides housing for the poor on a cross-subsidy basis or with public-private partnerships, the government could solve the problem of slums.

NOTES

<1> Income Approach: What It Is, How It's Calculated, Example.
Https://www.investopedia.com/terms/i/income-approach.asp

<2> Nepal Long Term Interest Rate.
Https://www.ceicdata.com/en/indicator/nepal/long-term-interest-rate

<3> Minimum Wage Nepal.
Https://wageindicator.org/salary/minimum-wage/nepal

<4> Urban Farming: Food Production in Community Parks and Private Gardens.
https://www.archdaily.com/916757/urban-farming-food-production-in-community-parks-and-private-gardens

REFERENCE

Minimum wage: 250 rupees per day.
Anna 1 = 342.25 sq.feet or 31.7961 sq.metres. Ropani 1 = 16 anna = 5,476 sq.feet = 508.7368 sq.metre.