Appendix A

System specific Sample Input Values used for illustration

diagramid	Description	Construction Period In Years	Annual Construction Expenses	Average Lease Rate/sqft	Annual Operating Expenses	Annual Occupancy Rate (%)	Initial Investment	Cap Rate (%)	Growth Rate (%)
53528	Verksamhetsområde avvecklas på-sikt	2	700000	5	700000	80	8000000	5	3
53570	commercial area	3	800000	7.5	650000	75	7800000	5	3

Appendix A1. Sample Input Values for Industry and Commerce, design-a.

diagramid	Description	Construction Period In Years	Annual Construction Expenses	Average Lease Rate/sqft	Annual Operating Expenses	Annual Occupancy Rate (%)	Initial Investment	Cap Rate (%)	Growth Rate (%)
53527	Nytt verksamhetsområde, gröna näringar	3	720000	7.5	630000	75	8000000	5	3
53600	suitable site for commerce/industries	2	900000	10	720000	85	9000000	5	3

Appendix A2. Sample Input Values for Industry and Commerce, design-b.

diagramid	Description	Construction Period In Years	Annual Construction Expenses	Expected Annual Units Rented	Unit Sale Price	Annual Operating Expenses	Annual Expected Rent Per Unit	Annual Expected Units Sold	Initial Investment	Cap Rate (%)	Growth Rate, Rent/Sale (%)	Growth Rate, Expenses (%)
53546	New housing	2	500000	20	200000	50000	20000	25	2500000	5	3	2
53566	Near to Åkarp services	2	400000	15	150000	50000	29000	20	1500000	5	3	2
53608	low density housing	2	300000	20	200000	40000	15000	10	1000000	5	3	2

Appendix A3. Sample Input Values for Low-density Housing, design-a.

diagramid	Description	Construction Period In Years	Annual Construction Expenses	Expected Annual Units Rented	Unit Sale Price	Annual Operating Expenses	Annual Expected Rent Per Unit	Annual Expected Units Sold	Initial Investment	Cap Rate (%)	Growth Rate, Rent/Sale (%)	Growth Rate, Expenses (%)
53546	New housing	2	500000	20	180000	50000	20000	25	2500000	5	3	2
53548	Low dens	2	300000	10	150000	30000	18000	27	1800000	5	3	2
53549	ldh4	2	300000	20	100000	40000	10000	29	1500000	5	3	2
53550	ldh5	2	300000	10	150000	35000	18000	27	2200000	5	3	2
53551	ldh7	2	300000	20	120000	30000	15000	23	2500000	5	3	2
53566	Near to Åkarp services	2	400000	15	150000	50000	19000	18	1500000	5	3	2
53573	New residential housing	2	500000	20	200000	40000	15000	25	2300000	5	3	2

Appendix 44. Sample Input Values for Low-density Housing, design-b.

diagramid	Description	Construction Period In Years	Annual Construction Expenses	Expected Annual Units Rented	Unit Sale Price	Annual Operating Expenses	Annual Expected Rent Per Unit	Annual Expected Units Sold	Initial Investment	Cap Rate (%)	Growth Rate, Rent/Sale (%)	Growth Rate, Expenses (%)
53531	Vinstorp	1	900000	90	3500000	700000	195000	20	85000000	6	3	2
53542	Late20506	1	1000000	85	2600000	900000	235000	27	80000000	6	3	2
53571	Remodel villas into communes	2	800000	90	3900000	650000	195000	18	60000000	6	3	2

Appendix A5. Sample Input Values for High-density Housing, design-a.

diagramid	Description	Construction Period In Years	Annual Construction Expenses	Expected Annual Units Rented	Unit Sale Price	Annual Operating Expenses	Annual Expected Rent Per Unit	Annual Expected Units Sold	Initial Investment	Cap Rate (%)	Growth Rate, Rent/Sale (%)	Growth Rate, Expenses (%)
53531	Vinstorp	1	900000	85	2900000	900000	235000	22	68000000	6	3	2
53534	2050Non	1	800000	90	3500000	700000	195000	18	75000000	6	3	2
53535	Non2020B	1	950000	85	2600000	900000	240000	26	80000000	6	3	2
53536	Non2050D	2	900000	90	3900000	650000	190000	17	60000000	6	3	2
53538	Late20502	1	1000000	85	3200000	290000	235000	20	73000000	6	3	2
53539	Late20503	1	700000	90	2900000	700000	250000	18	67000000	6	3	2
53541	Late20505	1	1000000	85	2200000	290000	235000	26	58000000	6	3	2
53542	Late20506	1	700000	75	2500000	700000	225000	30	82000000	6	3	2
53567	Good spot for housing.	1	1000000	90	3300000	100000	250000	18	70000000	6	3	2

	Infrastructure and serv...											
53571	Remodel villas into communes	1	700000	90	1750000	100000	350000	26	60000000	6	3	2

Appendix A6. Sample Input Values for High-density Housing, design-b.

diagramid	Description	Initial Investment	Construction Period In Years	Annual Construction Expenses	Annual Maintenance Expenses	Annual Insurance Costs	Annual Advertising Revenue	Growth Rate (%)	Cap Rate (%)
53568	Protected area	2000000	2	100000	50000	10000	200000	2	6
53585	Keep protected nature for recreation	1000000	1	50000	50000	5000	150000	2	6
53595	Highwaybuffer park	1000000	1	30000	20000	5000	80000	2	6

Appendix A7. Sample Input Values for GI, design-a.

diagramid	Description	Initial Investment	Construction Period In Years	Annual Construction Expenses	Annual Maintenance Expenses	Annual Insurance Costs	Annual Advertising Revenue	Growth Rate (%)	Cap Rate (%)
53582	Forest garden	500000	2	20000	10000	5000	30000	2	8
53585	Keep protected nature for recreation	1000000	1	50000	50000	5000	150000	2	6
53595	Highwaybuffer park	1000000	1	30000	20000	5000	100000	2	6

Appendix A8. Sample Input Values for GI, design-b.

diagramid	Description	Initial Investment	Construction Period In Years	Annual Construction Expenses	Annual Decommissioning Costs	Annual Water Resource Manage	Annual Water Quality Monitoring Costs	Annual Insurance Costs	Annual Water Purification Costs	Entertainment Revenue	Revenue From Fishing And Aquatic	Growth Rate (%)	Cap Rate (%)

						ment Costs					Products		
53572	Water management (pond e.g.)	500000	2	50000	10000	20000	5000	10000	10000	50000	30000	3	6
53562	New river	1000000	2	100000	20000	20000	10000	10000	50000	100000	50000	3	6

Appendix A9. Sample Input Values for BI, design-a.

diagram id	Description	Initial Investment	Construction Period In Years	Annual Construction Expenses	Annual Decommissioning Costs	Annual Water Resource Management Costs	Annual Water Quality Monitoring Costs	Annual Insurance Costs	Annual Water Purification Costs	Entertainment Revenue	Revenue From Fishing And Aquatic Products	Growth Rate (%)	Cap Rate (%)
53561	1m wall	500000	2	45000	12000	20000	5000	10000	10000	50000	30000	3	6
53601	Recreational /water capturing area	400000	2	50000	10000	20000	1000	15000	10000	50000	20000	3	6
53602	Flood capturing area	300000	3	20000	10000	10000	2000	5000	10000	0	70000	3	6

Appendix A 10. Sample Input Values for BI, design-b.

diagram id	Description	Construction Period In Years	Annual Construction Expenses	Initial Investment	Annual Operation and Maintenance Costs	Energy Sale Price	Estimated Annual Energy Production	Annual Decommissioning Costs	Annual Insurance Costs	Annual Fuel Costs	Annual Energy Storage and Distribution Costs	Growth Rate (%)	Cap Rate (%)
53575	Solar panel park	2	200000	2000000	20000	0.2	2000000	10000	2000	0	20000	3	6

53576	Wind farm	2	300000	3000000	15000	0.2	3000000	10000	2000	0	30000	3	6
53590	Combined solar panels and agriculture	1	150000	1000000	15000	0.2	3000000	10000	2000	0	40000	3	6

Appendix A 11. Sample Input Values for EI, design-a.

diagramid	**Description**	**Construction Period In Years**	**Annual Construction Expenses**	**Initial Investment**	**Annual Operation and Maintenance Costs**	**Energy Sale Price**	**Estimated Annual Energy Production**	**Annual Decommissioning Costs**	**Annual Insurance Costs**	**Annual Fuel Costs**	**Annual Energy Storage and Distribution Costs**	**Growth Rate (%)**	**Cap Rate (%)**
53583	Combined solar panels and agriculture	1	200000	2000000	20000	0.2	2000000	10000	2000	0	20000	3	6
53586	Solar panel park/agricultural land	1	200000	1500000	50000	0.2	1000000	10000	2000	0	50000	3	6
53590	Combined solar panels and agriculture	1	150000	1000000	50000	0.2	1300000	10000	1000	0	20000	3	6

Appendix A 12. Sample Input Values for EI, design-b.

Appendix B

Deliverables Link

Drive link containing the following:

1. Excel Sheet used for illustrating financial models in Excel during meetings with the industry partner.
2. Folder containing input (Geodesigns, Assumption values CSV) & output files (Financial Analysis JSON)
3. Python script producing the financial analysis
4. Property Financial Value Comparison dashboard created by PowerBI (This requires downloading the **Microsoft PowerBI** software first, then downloading the "ADS_Digital_Dashboard2.pbix" file and double-clicking it to open it with Microsoft PowerBI)
5. Interactive analytical HTML reports corresponding to each system. (Five HTML files in the folder "Interactive_Financial_Model")

Appendix C

Screenshots of HTML Dashboards

MANCHESTER 1824
The University of Manchester

BI Financial Model

Enter Financial Parameters:

Initial Investment(£):
500000

Annual Construction Expenses(£):
50000

Construction Period In Years(Year):
2

Entertainment Revenue(£):
50000

Revenue From Fishing And Aquatic Products(£):
30000

Annual Water Resource Management Costs(£):
20000

Annual Insurance Costs(£):
10000

Annual Water Quality Monitoring Costs(£):
5000

Annual Water Purification Costs(£):
10000

Annual Decommissioning Costs(£):
10000

Growth Rate (%):
3

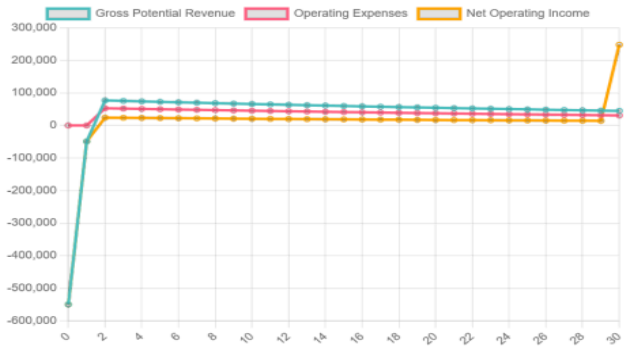
Cap Rate (%):
6

Compute and Draw Chart

Valuation for Year 30: 234005.75

IRR: 1.39%

30-year Financial Chart (Discounted)



Financial Data Table

Year	Gross Potential Revenue	Discounted Gross Potential Revenue	Operating Expenses	Discounted Operating Expenses	Discounted Net Operating Income
0	-550000.00	-550000.00	0.00	0.00	-550000.00
1	-51500.00	-49047.62	0.00	0.00	-49047.62
2	84872.00	76981.41	58349.50	52924.72	24056.69
3	87418.16	75515.09	60099.99	51916.63	23598.47
4	90040.70	74076.71	61902.98	50927.74	23148.97
5	92741.93	72665.73	63760.07	49957.69	22708.04
6	95524.18	71281.62	65672.88	49006.11	22275.51
7	98389.91	69923.87	67643.06	48072.66	21851.21
8	101341.61	68591.99	69672.35	47156.99	21435.00
9	104381.85	67285.47	71762.53	46258.76	21026.71
10	107513.31	66003.85	73915.40	45377.64	20626.20
11	110738.71	64746.63	76132.86	44513.31	20233.32
12	114060.87	63513.36	78416.85	43665.44	19847.93
13	117482.70	62303.58	80769.35	42833.71	19469.87
14	121007.18	61116.85	83192.43	42017.83	19099.01
15	124637.39	59952.72	85688.21	41217.49	18735.22
16	128376.52	58810.76	88258.85	40432.40	18378.36
17	132227.81	57690.56	90906.62	39662.26	18028.30
18	136194.64	56591.69	93633.82	38906.79	17684.90
19	140280.48	55513.75	96442.83	38165.70	17348.05
20	144488.90	54456.35	99336.12	37438.74	17017.61
21	148823.57	53419.08	102316.20	36725.62	16693.46
22	153288.27	52401.58	105385.69	36026.08	16375.49
23	157886.92	51403.45	108547.26	35339.87	16063.58
24	162623.53	50424.34	111803.68	34666.73	15757.61
25	167502.23	49463.87	115157.79	34006.41	15457.46
26	172527.30	48521.71	118612.52	33358.67	15163.03
27	177703.12	47597.48	122170.90	32723.27	14874.21
28	183034.21	46690.86	125836.02	32099.97	14590.89
29	188525.24	45801.51	129611.10	31488.54	14312.97
30	194181.00	44929.10	133499.44	30888.76	248046.09

Appendix C1. HTML Model for BI

MANCHESTER 1824
The University of Manchester

GI Financial Model

Enter Financial Parameters:

Initial Investment(£):
2000000

Annual Advertising Revenue(£):
200000

Annual Construction Expenses(£):
100000

Construction Period In Years(Year):
2

Annual Maintenance Expenses(£):
50000

Annual Insurance Costs(£):
10000

Growth Rate (%):
2

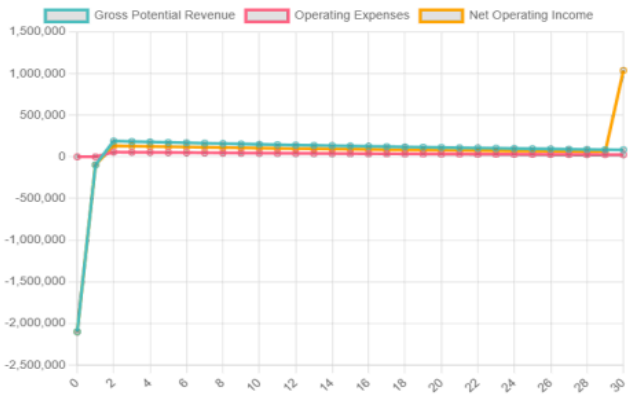
Cap Rate (%):
6

Compute and Draw Chart

Valuation for Year 30: 977919.18

IRR: 2.99%

30-year Financial Chart (Discounted)



Financial Data Table

Year	Gross Potential Revenue	Discounted Gross Potential Revenue	Operating Expenses	Discounted Operating Expenses	Discounted Net Operating Income
0	-2100000.00	-2100000.00	0.00	0.00	-2100000.00
1	-102000.00	-97142.86	0.00	0.00	-97142.86
2	208080.00	188734.69	62424.00	56620.41	132114.29
3	212241.60	183342.27	63672.48	55002.68	128339.59
4	216486.43	178103.92	64945.93	53431.18	124672.75
5	220816.16	173015.24	66244.85	51904.57	121110.67
6	225232.48	168071.95	67569.75	50421.58	117650.36
7	229737.13	163269.89	68921.14	48980.97	114288.92
8	234331.88	158605.04	70299.56	47581.51	111023.53
9	239018.51	154073.47	71705.55	46222.04	107851.43
10	243798.88	149671.37	73139.67	44901.41	104769.96
11	248674.86	145395.04	74602.46	43618.51	101776.53
12	253648.36	141240.90	76094.51	42372.27	98868.63
13	258721.33	137205.44	77616.40	41161.63	96043.81
14	263895.75	133285.29	79168.73	39985.59	93299.70
15	269173.67	129477.14	80752.10	38843.14	90634.00
16	274557.14	125777.79	82367.14	37733.34	88044.45
17	280048.28	122184.14	84014.49	36655.24	85528.90
18	285649.25	118693.16	85694.77	35607.95	83085.21
19	291362.23	115301.93	87408.67	34590.58	80711.35
20	297189.48	112007.59	89156.84	33602.28	78405.31
21	303133.27	108807.37	90939.98	32642.21	76165.16
22	309195.93	105698.59	92758.78	31709.58	73989.01
23	315379.85	102678.63	94613.96	30803.59	71875.04
24	321687.45	99744.96	96506.23	29923.49	69821.47
25	328121.20	96895.10	98436.36	29068.53	67826.57
26	334683.62	94126.67	100405.09	28238.00	65888.67
27	341377.30	91437.33	102413.19	27431.20	64006.13
28	348204.84	88824.84	104461.45	26647.45	62177.39
29	355168.94	86286.99	106550.68	25886.10	60400.89
30	362272.32	83821.64	108681.70	25146.49	1036594.34

Appendix C2. HTML Model for GI

MANCHESTER 1824
The University of Manchester

EI Financial Model

Enter Financial Parameters:

Initial Investment(£):
2000000

Annual Construction Expenses(£):
200000

Construction Period In Years(Year):
2

Energy Sale Price(£):
0.2

Estimated Annual Energy Production(£):
2000000

Annual Operation and Maintenance Costs(£): 20000

Annual Insurance Costs(£):
2000

Annual Fuel Costs(£):
0

Annual Energy Storage and Distribution Costs(£): 20000

Growth Rate (%):
3

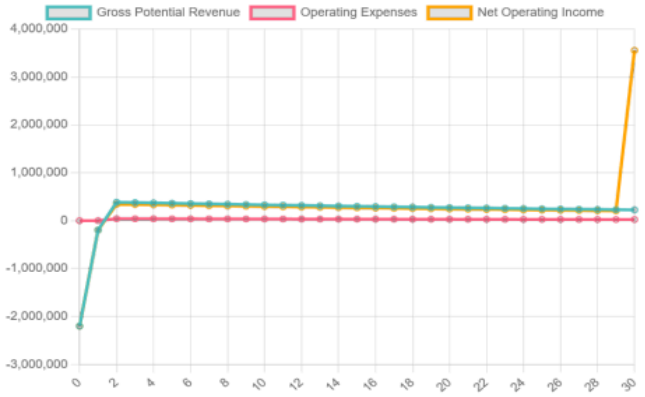
Cap Rate (%):
6

Compute and Draw Chart

Valuation for Year 30: 3350962.33

IRR: 11.50%

30-year Financial Chart (Discounted)



Financial Data Table

Year	Gross Potential Revenue	Discounted Gross Potential Revenue	Operating Expenses	Discounted Operating Expenses	Discounted Net Operating Income
0	-2200000.00	-2200000.00	0.00	0.00	-2200000.00
1	-206000.00	-196190.48	0.00	0.00	-196190.48
2	424360.00	384907.03	44557.80	40415.24	344491.79
3	437090.80	377575.47	45894.53	39645.42	337930.04
4	450203.52	370383.55	47271.37	38890.27	331493.28
5	463709.63	363328.63	48689.51	38149.51	325179.12
6	477620.92	356408.08	50150.20	37422.85	318985.23
7	491949.55	349619.36	51654.70	36710.03	312909.33
8	506708.03	342959.94	53204.34	36010.79	306949.15
9	521909.27	336427.37	54800.47	35324.87	301102.50
10	537566.55	330019.23	56444.49	34652.02	295367.21
11	553693.55	323733.15	58137.82	33991.98	289741.17
12	570304.35	317566.80	59881.96	33344.51	284222.29
13	587413.49	311517.91	61678.42	32709.38	278808.53
14	605035.89	305584.24	63528.77	32086.35	273497.89
15	623186.97	299763.59	65434.63	31475.18	268288.41
16	641882.58	294053.80	67397.67	30875.65	263178.15
17	661139.05	288452.78	69419.60	30287.54	258165.24
18	680973.22	282958.44	71502.19	29710.64	253247.80
19	701402.42	277568.76	73647.25	29144.72	248424.04
20	722444.49	272281.73	75856.67	28589.58	243692.15
21	744117.83	267095.41	78132.37	28045.02	239050.39
22	766441.36	262007.88	80476.34	27510.83	234497.05
23	789434.60	257017.26	82890.63	26986.81	230030.44
24	813117.64	252121.69	85377.35	26472.78	225648.91
25	837511.17	247319.37	87938.67	25968.53	221350.84
26	862636.51	242608.53	90576.83	25473.90	217134.63
27	888515.60	237987.41	93294.14	24988.68	212998.73
28	915171.07	233454.32	96092.96	24512.70	208941.61
29	942626.20	229007.57	98975.75	24045.79	204961.77
30	970904.99	224645.52	101945.02	23587.78	3552020.07

Appendix C3. HTML Model for EI

MANCHESTER 1824
The University of Manchester

IND Financial Model

Enter Financial Parameters:

Initial Investment(£):
2000000

Annual Construction Expenses(£):
200000

Construction Period In Years(Year):
2

Energy Sale Price(£):
0.2

Estimated Annual Energy Production(£):
2000000

Annual Operation and Maintenance Costs(£):
20000

Annual Insurance Costs(£):
2000

Annual Fuel Costs(£):
0

Annual Energy Storage and Distribution Costs(£):
20000

Growth Rate (%):
3

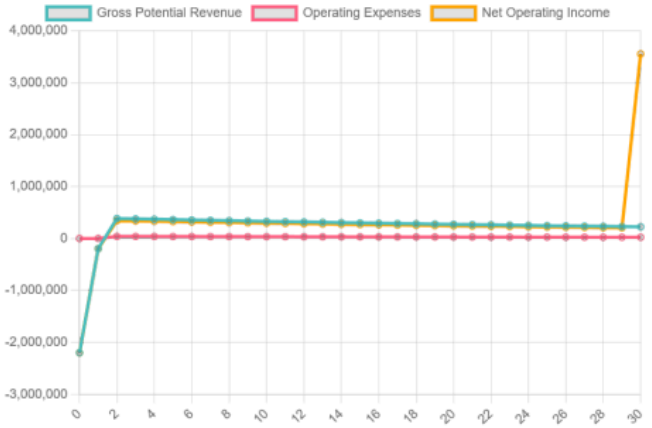
Cap Rate (%):
6

Compute and Draw Chart

Valuation for Year 30: 3350962.33

IRR: 11.50%

30-year Financial Chart (Discounted)



Financial Data Table

Year	Gross Potential Revenue	Discounted Gross Potential Revenue	Operating Expenses	Discounted Operating Expenses	Discounted Net Operating Income
0	-2200000.00	-2200000.00	0.00	0.00	-2200000.00
1	-206000.00	-196190.48	0.00	0.00	-196190.48
2	424360.00	384907.03	44557.80	40415.24	344491.79
3	437090.80	377575.47	45894.53	39645.42	337930.04
4	450203.52	370383.55	47271.37	38890.27	331493.28
5	463709.63	363328.63	48689.51	38149.51	325179.12
6	477620.92	356408.08	50150.20	37422.85	318985.23
7	491949.55	349619.36	51654.70	36710.03	312909.33
8	506708.03	342959.94	53204.34	36010.79	306949.15
9	521909.27	336427.37	54800.47	35324.87	301102.50
10	537566.55	330019.23	56444.49	34652.02	295367.21
11	553693.55	323733.15	58137.82	33991.98	289741.17
12	570304.35	317566.80	59881.96	33344.51	284222.29
13	587413.49	311517.91	61678.42	32709.38	278808.53
14	605035.89	305584.24	63528.77	32086.35	273497.89
15	623186.97	299763.59	65434.63	31475.18	268288.41
16	641882.58	294053.80	67397.67	30875.65	263178.15
17	661139.05	288452.78	69419.60	30287.54	258165.24
18	680973.22	282958.44	71502.19	29710.64	253247.80
19	701402.42	277568.76	73647.25	29144.72	248424.04
20	722444.49	272281.73	75856.67	28589.58	243692.15
21	744117.83	267095.41	78132.37	28045.02	239050.39
22	766441.36	262007.88	80476.34	27510.83	234497.05
23	789434.60	257017.26	82890.63	26986.81	230030.44
24	813117.64	252121.69	85377.35	26472.78	225648.91
25	837511.17	247319.37	87938.67	25968.53	221350.84
26	862636.51	242608.53	90576.83	25473.90	217134.63
27	888515.60	237987.41	93294.14	24988.68	212998.73
28	915171.07	233454.32	96092.96	24512.70	208941.61
29	942626.20	229007.57	98975.75	24045.79	204961.77
30	970904.99	224645.52	101945.02	23587.78	3552020.07

Appendix C4. HTML Model for IND

The University of Manchester

LDH & HDH Financial Model

Enter Financial Parameters:

Initial Investment(£):
2500000

Annual Construction Expenses(£):
500000

Construction Period In Years(Year):
2

Annual Expected Rent Per Unit(£):
20000

Expected Annual Units Rented:
20

Annual Expected Units Sold:
25

Unit Sale Price(£):
200000

Annual Operating Expenses(£):
50000

Growth Rate, Rent/Sale (%):
3

Growth Rate, Expenses (%):
2

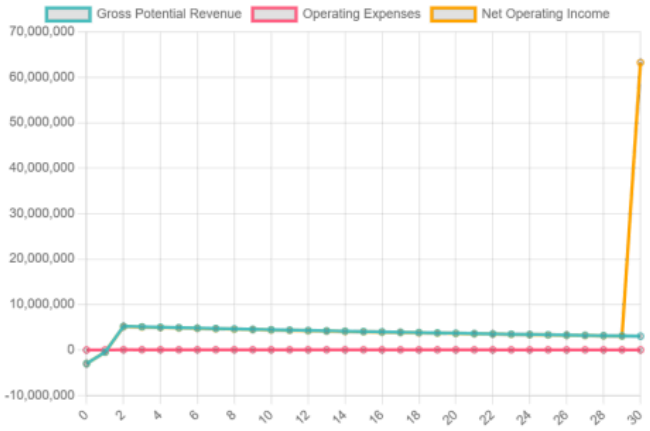
Cap Rate (%):
5

Compute and Draw Chart

Valuation for Year 30: 60235181.94

IRR: 83.89%

30-year Financial Chart (Discounted)



Financial Data Table

Year	Gross Potential Revenue	Discounted Gross Potential Revenue	Operating Expenses	Discounted Operating Expenses	Discounted Net Operating Income
0	-3000000.00	-3000000.00	0.00	0.00	-3000000.00
1	-510000.00	-485714.29	0.00	0.00	-485714.29
2	5728860.00	5196244.90	52020.00	47183.67	5149061.22
3	5900725.80	5097268.80	53060.40	45835.57	5051433.24
4	6077747.57	5000177.97	54121.61	44525.98	4955651.99
5	6260080.00	4904936.49	55204.04	43253.81	4861682.68
6	6447882.40	4811509.12	56308.12	42017.99	4769491.14
7	6641318.87	4719861.33	57434.28	40817.47	4679043.86
8	6840558.44	4629959.21	58582.97	39651.26	4590307.95
9	7045775.19	4541769.51	59754.63	38518.37	4503251.14
10	7257148.45	4455259.62	60949.72	37417.84	4417841.77
11	7474862.90	4370397.53	62168.72	36348.76	4334048.77
12	7699108.79	4287151.86	63412.09	35310.22	4251841.64
13	7930082.05	4205491.82	64680.33	34301.36	4171190.46
14	8167984.51	4125387.22	65973.94	33321.32	4092065.90
15	8413024.05	4046808.41	67293.42	32369.28	4014439.13
16	8665414.77	3969726.35	68639.29	31444.45	3938281.90
17	8925377.21	3894112.51	70012.07	30546.03	3863566.48
18	9193138.53	3819938.94	71412.31	29673.29	3790265.65
19	9468932.69	3747178.20	72840.56	28825.48	3718352.72
20	9753000.67	3675803.38	74297.37	28001.90	3647801.48
21	10045590.69	3605788.08	75783.32	27201.84	3578586.23
22	10346958.41	3537106.40	77298.98	26424.65	3510681.75
23	10657367.16	3469732.94	78844.96	25669.66	3444063.29
24	10977088.17	3403642.79	80421.86	24936.24	3378706.55
25	11306400.82	3338811.50	82030.30	24223.77	3314587.73
26	11645592.84	3275215.09	83670.91	23531.67	3251683.42
27	11994960.63	3212830.04	85344.32	22859.33	3189970.71
28	12354809.45	3151633.28	87051.21	22206.21	3129427.07
29	12725453.73	3091602.17	88792.23	21571.75	3070030.42
30	13107217.34	3032714.51	90568.08	20955.41	63246941.04

Appendix C5. HTML Model for LDH & HDH