

My Dream House in New Jersey

Decision & Risk Analysis Study
Vinay Rajesh Gor



Table of Contents

List of Figures.....	3
List of Tables.....	3
1 Summary.....	4
2 System Design.....	5
2.1 Mission & Concept of Operations.....	5
2.2 Stakeholders.....	6
3 Major Uncertainties/Assumptions.....	6
3.1 Uncertainties.....	6
3.2 Assumptions.....	6
4 Objectives.....	7
4.1 Fundamental objective.....	7
4.2 Means Objective Network.....	8
5 Alternatives.....	8
5.1 Generating Alternatives.....	8
5.2 Description & Evaluation of Alternatives.....	9
6 Trade study analysis.....	6
6.1 Process.....	13
6.2 Criteria.....	14
6.2.1 Pairwise comparison of criteria.....	14
6.2.2 Scoring Descriptions.....	15
6.2.2.1 Transportation Cost.....	15
6.2.2.2 Crime Rate.....	16
6.2.2.3 Indian Community.....	16
6.3 Evaluation.....	16
6.4 Sensitivity Analysis.....	17
7 Final Recommendation.....	19
8 Threats & Opportunity.....	19
8.1 Threats & Opportunities log	19
8.2 Risk Assessment.....	20

List of Figures

<i>Fig 1. Geographic location of New York City & New Jersey.....</i>	5
<i>Fig 2. Fundamental Objective & Supporting Objectives.....</i>	7
<i>Fig 3. Means Objective Network.....</i>	8
<i>Fig. 4 Geographic location of Edison.....</i>	9
<i>Fig. 5 Geographic location of Elizabeth.....</i>	9
<i>Fig. 6 Geographic location of Hackensack.....</i>	10
<i>Fig. 7 Geographic location of Hoboken.....</i>	11
<i>Fig. 8 Geographic location of Jersey City.....</i>	11
<i>Fig. 9 Geographic location of Newark.....</i>	12
<i>Fig. 10 Pairwise Comparison of alternatives.....</i>	14
<i>Fig. 11 Utility Curve - Transportation Cost.....</i>	15
<i>Fig. 12 Utility Curve - Crime Rate.....</i>	15
<i>Fig. 13 Utility Curve - Indian Community.....</i>	16

List of Tables

<i>Table 1. Stakeholders.....</i>	6
<i>Table 2. Must-have criteria.....</i>	13
<i>Table 3. Want criteria.....</i>	13
<i>Table 4. Scale legend.....</i>	14
<i>Table 5 Utility Table - Transportation Cost.....</i>	15
<i>Table 6 Utility Table - Crime Rate.....</i>	15
<i>Table 7 Utility Table - Indian Community.....</i>	16
<i>Table 8 Kepner - Tregoe Model for scoring alternatives.....</i>	16
<i>Table 9 & Table 10 Decreasing Transportation Cost by 10%</i>	17
<i>Table 10 Decreasing Crime rate by 10%.....</i>	18
<i>Table 12 Threats Log.....</i>	19
<i>Table 13 Opportunities Log.....</i>	20

1. Summary

Recently, I have been offered a full-time Fintech job at Manhattan in New York City. Along with that lately my family and I were having thoughts revolving around buying a new house which will be so called as "A Dream House" for our family. This 3 Bedroom 2 Bath dream house will be a one time investment considering at least next 20 years. Combination of these two instances lead us to decide to buy a new house around New York City.

Although New York City has a great living lifestyle there are several factors which restrict us in choosing living in NYC which includes,

1. Expensive & Compact Housing
2. Heavy traffic
3. High Parking prices
4. Higher Taxes
5. Additional 3.876% city tax for living in NYC
6. Less choices for Public Schools
7. Less scenery
8. Plenty of Noise

Now considering the geographic vicinity of New York City, several cities of New Jersey state such as Hoboken, Jersey City, Newark, Edison, Parsippany, Hackensack, Elizabeth are very close to NYC which overcomes most of the cons of living in NYC.

This decision & risk analysis study will recommend the best city to live in New Jersey when working in New York City considering many qualitative & quantitative data. To start with system design will be briefly discussed along with objectives which includes active & passive stakeholders. Several alternatives will be evaluated based on criterias & weights. Finally based on sensitivity analysis, opportunities & threats a final recommendation will be made.

2. System Definition

2.1 Mission & Concept of Operations

The purpose of this Decision & Risk Analysis study is to evaluate the best city to live in New Jersey while working in New York City so as to buy “A Dream House”.

There will be several factors which will be considered such as average cost of 3 Bedroom 2 Bathroom apartments, Average area, Amenities, Safety in the city, Parking space & its cost, Indian community, Indian Groceries, Public Schools, Public Hospitals, Transportation feasibility, Transportations cost, etc.

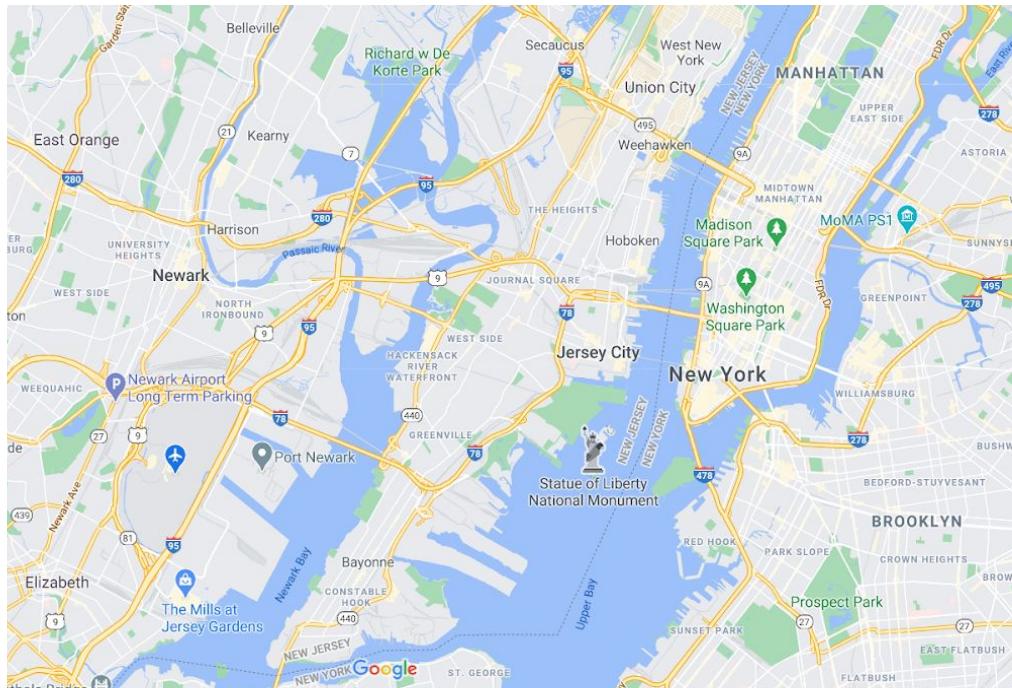


Fig 1. Geographic location of New York City & New Jersey

As from the map it is clear that some cities of New Jersey are geographically close to New York City hence these cities will be considered as prime cities which will be evaluated. These cities are Hoboken (Hudson County), Jersey City (Hudson County), Newark (Essex), Edison (Middlesex), Hackensack (Bergen) and Elizabeth (Union).

2.2 Stakeholders

Stakeholders are the people affected by this decision. This involves Active & Passive Stakeholders which are as listed,

Table 1. Stakeholders

Stakeholder	Type	Interest
Myself	Active	Primary Residence
My Family (Mother, Father, Sister, Wife)	Active	Primary Residence
State of New Jersey	Passive	Economic
Local Community	Passive	Networking
Company	Passive	Productivity

3. Major Uncertainties & Assumptions

3.1 Uncertainties

There are several uncertainties One uncertainty is that me & my family are moving altogether to a different place. It's difficult to say how much time it will take me & my family to adjust in a new place. Along with that at what extent transportation everyday to New York City will be feasible

3.2 Assumptions

The major assumption which is considered is the lifestyle of New Jersey more or less equivalent to New York City which may or may not be true. Another assumption on which we are taking this house is considering my job as permanent whereas considering the current scenario across the world job location, status, project can change in fraction of seconds.

4. Objectives

Objectives form the basis of the study which is the end result of the study which I want to achieve. Objective consists of first the fundamental objective which is the ultimate goal and means objective network which compromises of achieving supporting objectives.

4.1 Fundamental objective

The diagram below shows the fundamental objective and supporting objectives for selecting our new house.

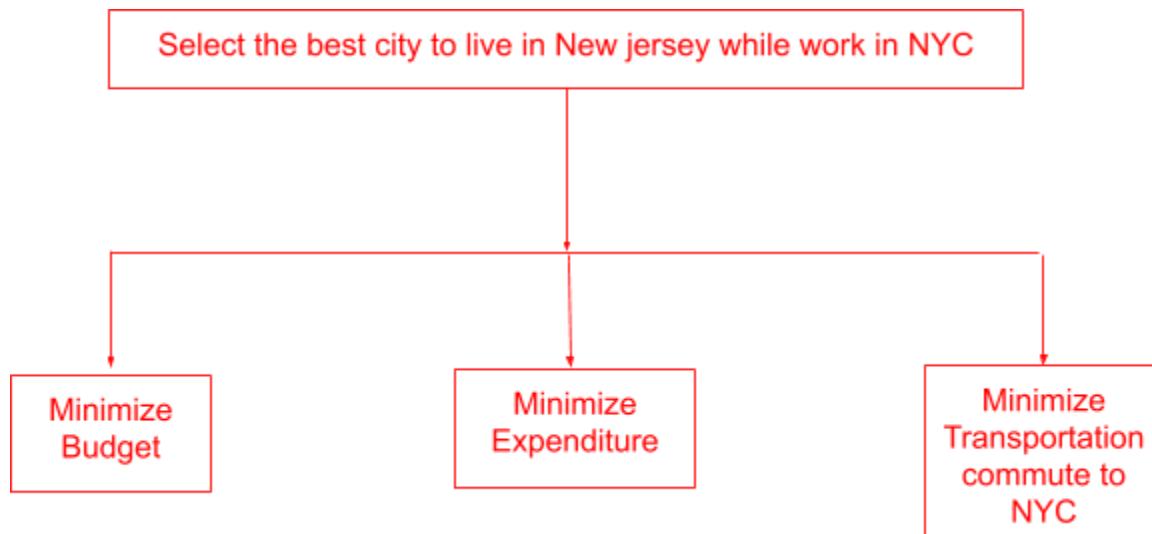


Fig 2. Fundamental Objective & Supporting Objectives

4.2 Means Objective Network

Objective network represents how supporting objectives can be achieved. These supporting objectives can help us to select our Fundamental objective.

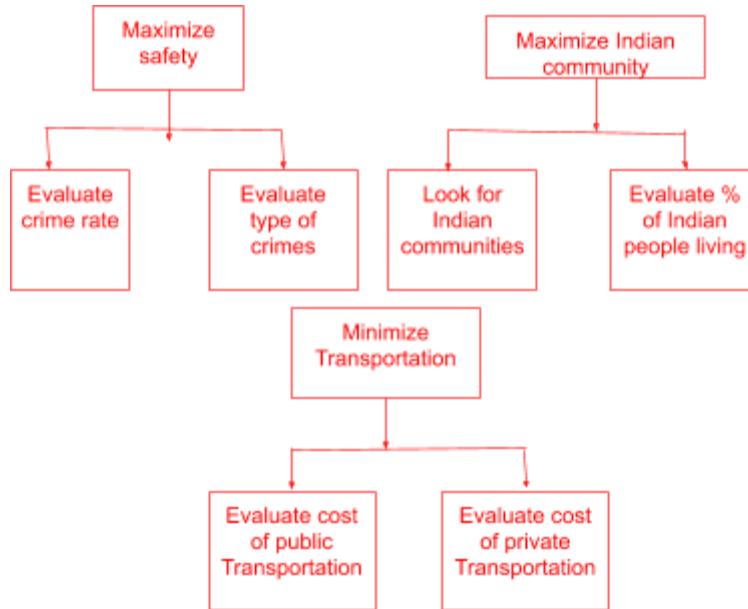


Fig 3. Means Objective Network

5. Alternatives

5.1 Generating Alternatives

While there are 565 options of cities to choose from New Jersey I had to restrict my options in choosing cities which are close to New York City. This was the first criteria to decide the city which lies to the boundary of NYC. Next factors such as Transportation feasibility, community, etc were considered. Thus, narrowed down my list to 7 cities which are,

- Edison (Middlesex)
- Elizabeth (Union)
- Hackensack (Bergen)
- Hoboken (Hudson County)
- Jersey City (Hudson County)
- Newark (Essex)

5.2 Description & Evaluation of Alternatives

The following description and technical data was extracted from some reliable websites.

5.2.1 Edison (Middlesex)

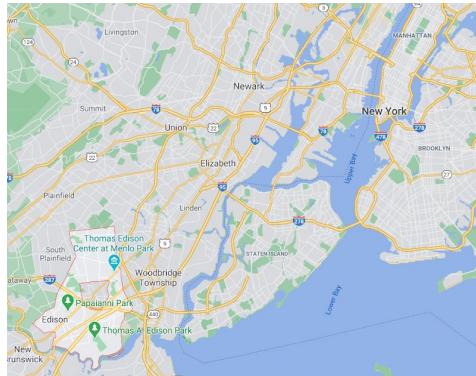


Fig. 4 Geographic location of Edison

Average prices (3 Bathroom 2 Bedroom): \$3,39,000

Gas, Electricity, Cooling: Water and Garbage: $\approx \$100$

Population Density: 3,397 people per sq

Transportation to NYC time: 1 hr 15 min

Transportation to NYC cost: \$11

Indian Community: 17.29%

Local Sales Tax: 6.625%

Crime Rate: 6 per 1,000 residents

5.2.2 Elizabeth (Union)

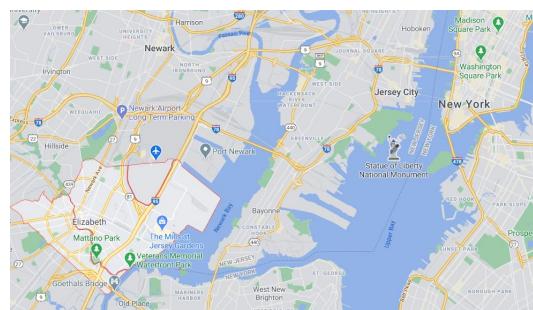


Fig. 5 Geographic location of Elizabeth

Average prices (3 Bathroom 2 Bedroom): \$3,30,000
 Gas, Electricity, Cooling: Water and Garbage: ≈\$100
 Population Density: 9,865 people per sq
 Transportation to NYC time: 30 mins
 Transportation to NYC cost: \$6.75
 Indian Community: 0.99%
 Local Sales Tax: 6.625%
 Crime Rate: 4 per 1,000 residents

5.2.3 Hackensack (Bergen)

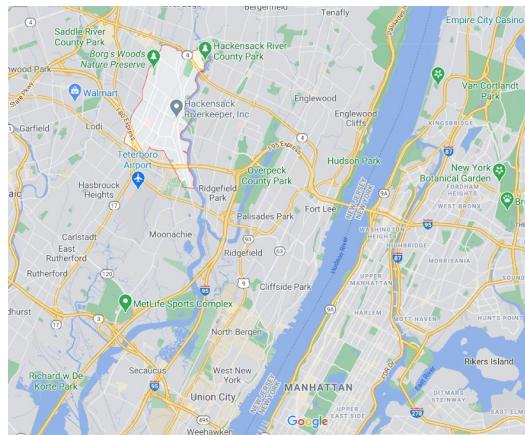


Fig. 6 Geographic location of Hoboken

Average prices (3 Bathroom 2 Bedroom): \$3,86,000
 Gas, Electricity, Cooling: Water and Garbage: ≈\$100
 Population Density: 10,754 people per sq
 Transportation to NYC time: 1 hr 15 min
 Transportation to NYC cost: \$12
 Indian Community: 2.55%
 Local Sales Tax: 6.625%
 Crime Rate: 3 per 1,000 residents

5.2.4 Hoboken (Hudson County)

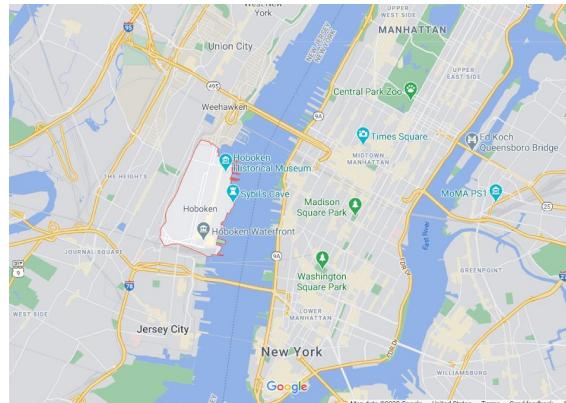


Fig. 7 Geographic location of Hoboken

Average prices (3 Bathroom 2 Bedroom): \$6,89,000

Gas, Electricity, Cooling: Water and Garbage: $\approx \$120$

Population Density: 42,749 people per sq

Transportation to NYC time: 30 mins

Transportation to NYC cost: \$2.75

Indian Community: 1.63%

Local Sales Tax: 6.625%

Crime Rate: 2 per 1,000 residents

5.2.5 Jersey City (Hudson County)

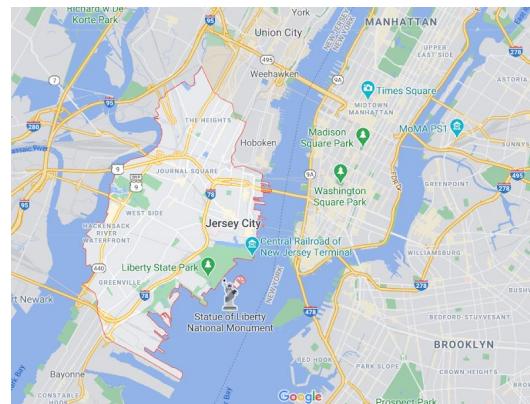


Fig. 8 Geographic location of Jersey City

Average prices (3 Bathroom 2 Bedroom): \$4,54,000
 Gas, Electricity, Cooling: Water and Garbage: ≈\$100
 Population Density: 17,954 people per sq
 Transportation to NYC time: 30 mins
 Transportation to NYC cost: \$2.75
 Indian Community: 5.49%
 Local Sales Tax: 6.63%
 Crime Rate: 4 per 1,000 residents

5.2.6 Newark (Essex)

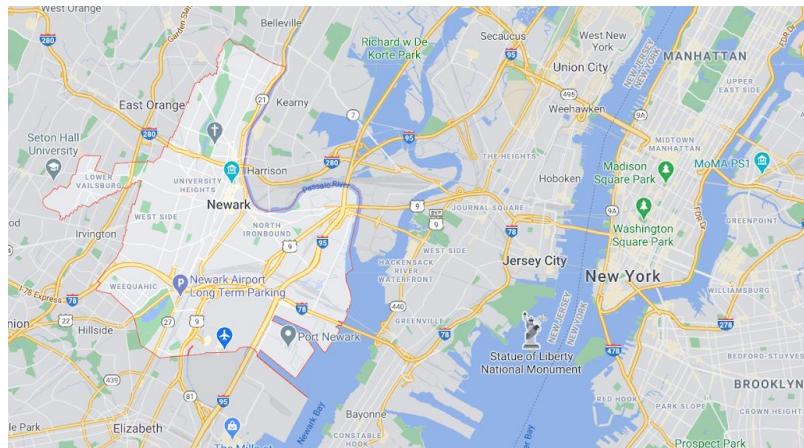


Fig. 9 Geographic location of Newark

Average prices (3 Bathroom 2 Bedroom): \$3,27,000
 Gas, Electricity, Cooling: Water and Garbage: ≈\$100
 Population Density: 11,458 people per sq
 Transportation to NYC time: 40 mins
 Transportation to NYC cost: \$3
 Indian Community: 0.52%
 Local Sales Tax: 6.63%
 Crime Rate: 10 per 1,000 residents

6. Engineering Trade Study Analysis

6.1 Process

The decision alternatives chosen were the top cities of New Jersey which are close to NYC within commute feasibility. The must have criteria include cities which are in budget and commute distance. Then I will choose want criteria which includes the criterias which are important for my decision making.

6.2 Criteria

Criterias are a set of factors which are most important attributes for decision making. Some of the criteria are must-have and some are want criteria. The following table shows a list of must have criteria and want criteria.

Table 2. Must-have criteria

Must-have	Why
Budget ($\leq \$500,000$)	Our family has decided a maximum budget of \$500,000 which will be invested for this new house. Hence cities where 3 Bedroom 2 Bathrooms apartment are under average price of $\leq \$500,000$ are only considered.
Commute Distance of (≤ 45 mins)	Travel commute will be everyday from Home to Office and vice versa. Specially during winters it might get difficult hence city with travel commute of less than or equal to 45 mins is a must-have

Table 3. Want criteria

Want	Why
Transportation Cost	As travel commutes will be inevitable everyday hence transportation cost comes with transportation. I want to minimize transportation costs as much as possible. In the long term this will impact my expenditures.

Indian Community	As my family is conservative related to Indian traditions and living, we will look for a city which has a decent percentage of Indian community around.
Crime Rate	As I will be living with my family I want the city to be safe with a minimum amount of Crime rate around the city. I don't have to worry about my and my family's safety.

6.2.1 Pairwise comparison of criteria

Pairwise wise comparison is the weighted comparisons between the want criterias. The range of scale for pairwise comparison starts from a scale of 1 (minimum) and goes to a range of 10 (maximum).

Pairwise comparisons among objectives/alternatives				Weights
	Transportation Cost	Indian Community	Crime Rate	
Transportation Cost	1.00	7.00	5.00	0.6843
Indian Community	0.14	1.00	5.00	0.2276
Crime Rate	0.20	0.20	1.00	0.0881

Fig. 10 Pairwise Comparison of alternatives

Table 4. Scale legend

1	Equal Importance
3	Moderate Importance over other
5	Strong Importance
7	Very Strong Importance
9	Extreme Importance
2,4,6,8	Intermediate Values

6.2.2 Scoring Descriptions

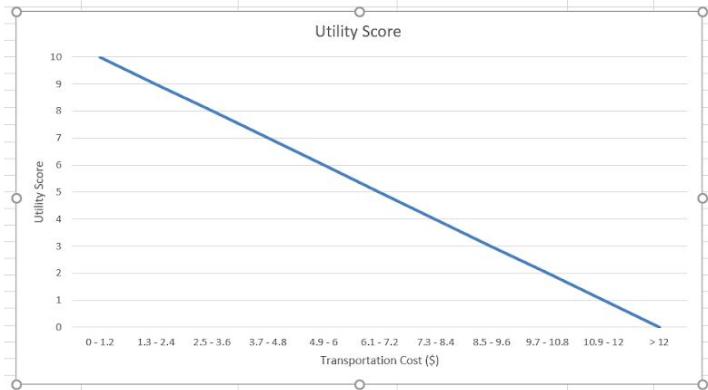
Scoring is a way of assigning quantitative values based on range of values. It helps to determine us to give the rating. I used a scale of 1-10 for this. Each section below shows the utility table and its graphical representation.

6.2.2.1 Transportation Cost

Table 5 Utility Table

Transportation Cost (\$)	Utility Score
0 - 1.2	10
1.3 - 2.4	9
2.5 - 3.6	8
3.7 - 4.8	7
4.9 - 6	6
6.1 - 7.2	5
7.3 - 8.4	4
8.5 - 9.6	3
9.7 - 10.8	2
10.9 - 12	1
> 12	0

Fig. 11 Utility Curve

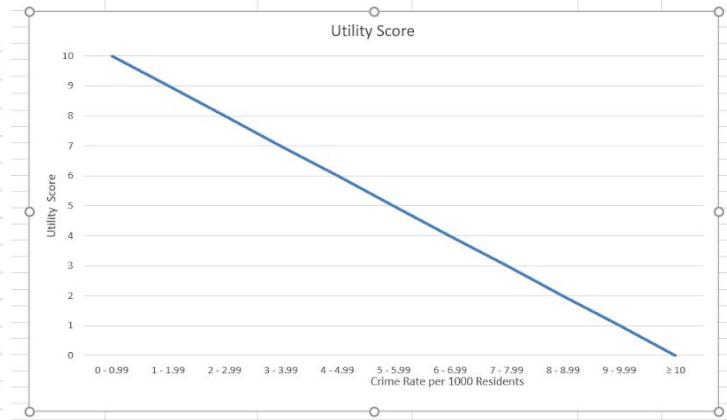


6.2.2.2 Crime Rate

Table 6 Utility Table

Crime Rate per 1000 residents	Utility Score
0 - 0.99	10
1 - 1.99	9
2 - 2.99	8
3 - 3.99	7
4 - 4.99	6
5 - 5.99	5
6 - 6.99	4
7 - 7.99	3
8 - 8.99	2
9 - 9.99	1
≥ 10	0

Fig. 12 Utility Curve

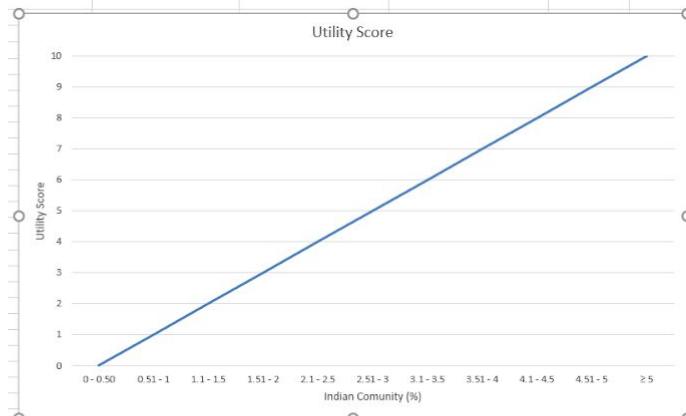


6.2.2.3 Indian Community

Table 7 Utility Table

Indian Community (%)	Utility Score
0 - 0.50	0
0.51 - 1	1
1.1 - 1.5	2
1.51 - 2	3
2.1 - 2.5	4
2.51 - 3	5
3.1 - 3.5	6
3.51 - 4	7
4.1 - 4.5	8
4.51 - 5	9
≥ 5	10

Fig. 13 Utility Curve



6.3 Evaluation

For evaluation we have used the Kepner - Tregoe model which has must-have criteria which acts as a pass/fail test. After evaluating the must have criteria we consider want criteria and assign numerical values to the factors according to their utilities scores. Finally after quantitative relative merit scores are assigned the best of the scores are considered.

Table 8 Kepner - Tregoe Model for scoring alternatives

Criteria	Edison (Middlesex)		Elizabeth (Union)		Hackensack (Bergen)	
	Information	Yes/No	Information	Yes/No	Information	Yes/No
Budget ≤ \$500,000	\$3,39,000	Yes	\$3,30,000	Yes	\$3,86,000	Yes
Commute Time ≤ 45 mins	1 hr 15 min	No	30 mins	Yes	1 hr 15 min	No
Wants	Value	Score	Value	Score	Value	Score
Transportation Cost			5	3.421474737		
Indian Community			1	0.227626551		
Crime Rate			6	0.52847101		
Relative Merit				4.177572298		

Criteria	Hoboken (Hudson County)		Jersey City (Hudson County)		Newark (Essex)	
	Information	Yes/No	Information	Yes/No	Information	Yes/No
Budget ≤ \$500,000	\$6,89,000	No	\$4,54,000	Yes	\$3,27,000	Yes
Commute Time ≤ 45 mins	30 mins	yes	30 mins	Yes	≤ 45 mins	40 mins
Wants	Value	Score	Value	Score	Value	Score
Transportation Cost			8	5.474359579	8	5.474359579
Indian Community			5	1.138132755	1	0.227626551
Crime Rate			6	0.52847101	0	0
Relative Merit				7.140963344		5.70198613

According to the model first Must-have criteria are checked and it is assigned as pass/fail criteria. If the must-have criteria of the alternatives which fit the criteria is proceeded to want criteria otherwise they are rejected straight away. For instance Edison (Middlesex), Hackensack (Bergen), Hoboken (Hudson County) are rejected straight away as criteria/s doesn't fit. For the decision alternatives whose must-have criteria fits are rated with utility scores from a range of 1- 10 and they are assigned weightage with pairwise comparison. The weightage of each criterion is computed using the sum of all pairwise scores. Finally one with highest relative merit is selected.

From the analysis of Kepner - Tregoe model it is clear that Jersey City (Hudson County) is the clear winner with a score of 7.14

6.4 Sensitivity Analysis

From the results it is clear that Jersey City (Hudson County) is better than any city to live in while working for NYC. But other 2 cities i.e Newark (Essex) & Elizabeth (Union) were just behind Jersey City.

Comparing Jersey City & Elizabeth, Transportation was the main factor whereas they rated equal for crime rate. So having curiosity If my results are not biased with Transportation cost I tried to decrease the weightage of transportation by 10% and assigning the same 10% to other 2 factors.

Table 9 Decreasing Transportation Cost by 10% and assigning the equivalent weightage to Indian Community

Criteria	Weight	Elizabeth (Union)		Jersey City (Hudson County)		Newark (Essex)	
		Value	Score	Value	Score	Value	Score
Wants							
Transportation Cost	0.615865453	5	3.079327263	8	4.926923621	8	4.926923621
Indian Community	0.296056046	1	0.296056046	5	1.480280228	1	0.296056046
Crime Rate	0.088078502	6	0.52847101	6	0.52847101	0	0
Total Weight	1						
Relative Merit			3.903854319		6.93567486		5.222979067

Table 10 Decreasing Transportation cost by 10% and assigning the equivalent weightage to Crime rate

Criteria	Weight	Elizabeth (Union)		Jersey City (Hudson County)		Newark (Essex)	
		Value	Score	Value	Score	Value	Score
Wants							
Transportation Cost	0.615865453	5	3.079327263	8	4.926923621	8	4.926923621
Indian Community	0.227626551	1	0.227626551	5	1.138132755	1	0.227626551
Crime Rate	0.149665047	6	0.897990282	6	0.897990282	0	0
Total Weight	0.993157051						
Relative Merit			4.204944096		6.963046658		5.154550172

Comparing the Jersey City and Newark, Crime rate was the main issue so I tried to reduce the weightage to Crime Rate by 10 and assign the same to Indian Community just to see if Newark is not left behind purely on terms of Crime Rate as Transportation Cost are almost the same.

Table 11 Decreasing Crime rate by 10% and assigning the equivalent weightage to Indian Community

Criteria	Weight	Elizabeth (Union)		Jersey City (Hudson County)		Newark (Essex)	
		Value	Score	Value	Score	Value	Score
Wants							
Transportation Cost	0.684294947	5	3.421474737	8	5.474359579	8	5.474359579
Indian Community	0.236434401	1	0.236434401	5	1.182172005	1	0.236434401
Crime Rate	0.079270652	6	0.475623909	6	0.475623909	0	0
Total Weight	1						
Relative Merit			3.949945747		7.140963344		5.474359579

As the values are apart and choices are fixed by sensitivity analysis there are small differences which are achieved but it doesn't impact my decision.

7 Final Recommendation

After careful technical analysis of alternatives it is evident that Jersey City (Hudson) is the best choice. Jersey City passed the must-have criteria and also it was merit in wants. Although other cities were also close but Jersey City outnumbered all with huge margin considering various criterias.

Jersey City is no doubt the best choice for the city in New Jersey to live in while working in NYC if you want to have a decent budget, save time, save transportation cost, have indian community and less crime rate.

8 Threats & Opportunity

8.1 Threats & Opportunities Log

Table 12 shows the risk log describing 3 threats and Table 14 shows opportunities possible associated with buying “Dream House”. In the following table P represents Probability on a scale of 1-10. I represent the Impact on a scale of 1-5 which can have an impact on my decision. And $P \times I$ is the risk value(1 - 50). Mitigation strategy describes the planning which I need to do.

Table 12 Threats Log

No	Risk Item	Consequence	P	I	$P \times I$	Mitigation Strategy
1	If I am fired or shifted to another city/state/county	Then Investing such a huge amount for house might go in vain	2	5	10	<ul style="list-style-type: none"> • Look for another company • Look for job around same location • Request company that you have settled in New Jersey shifting is difficult
2	If transportation cost might increase with time	Then financial burden will increase	2	2	4	<ul style="list-style-type: none"> • Plan for alternatives. For example From Bus to Train or getting a private vehicle to commute • Plan for financial stuff in advance
3	If commute time changes depending upon the weather	Then commute time may increase	5	3	15	<ul style="list-style-type: none"> • Plan well in advance about the most feasible alternatives options of transportation available • Plan to leave early so as to reach on time • Always check the weather before a day and plan accordingly for the next day

Table 13 Opportunities Log

No	Risk Item	Consequence	P	I	P x I	Mitigation Strategy
1	If I am able to adjust & everything goes well as planned	Then Investing such a huge amount for a house might be fruitful. Me and my family would live happily	8	5	40	<ul style="list-style-type: none"> • Look for Indian communities near by • Look for different amenities such as Government schools, Hospitals etc. • Know the locality and know the area.

8.2 Risk Assessment

Every coin has 2 sides likewise every decision taken has 2 sides of the coin 1 is the threat and other is the opportunity. It is evident that even my decision has 3 threats which are possible but evaluating them helps to understand that they are not extreme issues. Along with making mitigation strategies gives us several options for considerations. Accessing Mitigation strategy gives us the confidence for risk assessment & its management.

Sources

- <http://zipatlas.com/us/nj/city-comparison/percentage-indian-population.htm>
- https://www.bestplaces.net/cost_of_living/state/new_jersey
- <https://www.census.gov/quickfacts/fact/table/newarkcitynewjersey,US/PST045219>
- https://www.google.com/maps?q=nyc+map&um=1&ie=UTF-8&sa=X&ved=2ahUKEwi69PK-IMrtAhWkxFkKhdrnDBcQ_AUoAXoECBIQAw
- https://www.realtor.com/realestateandhomes-search/Edison_NJ/beds-3-3
- <https://www.zillow.com/edison-nj/>
- <https://www.macrotrends.net/cities/us/nj/newark/crime-rate-statistics#:~:text=The%20Newark%20NJ%20crime%20rate,a%202013.06%25%20decline%20from%202014.>
- <https://www.njtransit.com/getting-new-york-train>