Feasibility Study
On Development Project Planning, Designing and Implementation Perspective

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Project, Feasibility Study and its Components

- A project may be defined as a sequence of tasks required to achieve certain objective / objectives and, that must be completed within a certain period of time to attain certain outcome / outcomes.

- A feasibility study is an analysis that takes all of a project's relevant factors into account—including economic, technical, legal, and scheduling considerations—to ascertain the likelihood of achieving its objectives and completing the project successfully.

Feasibility Study Components

Generally a Feasibility Study of a project may include but not limited to four components

- Purpose
- Technical Components
- Project Financing and Cost-Benefit Analysis Components
- Legal Issues and Others

Currently Planning Commission have formulated Feasibility Study Guidelines. That includes the following components:

- Basic Information
- General Introduction
- Market / Demand Analysis
- Technical / Technological and Engineering Analysis
- Environmental Sustainability, Climate Resilience and Disaster Risk Analysis
- Cost-Benefit Analysis

Feasibility Study Components (Contd.)

- Human Resources and Administrative Support Analysis (During and Post Project)
- Institutional and Legal Analysis
- Alternatives / Options Analysis
- Recommendation and Conclusion
- Annexes

Why Feasibility Study

- Proper Planning
- Proper Designing
- Efficient Utilization of Limited Resources
- Well Being of People
- Successful Implementation of a Project

Projects without Feasibility Study or with poor Feasibility Study may result in -

- (Insufficient Financing)
- Multiple Revision of Projects with Increased Cost and Multiple Time Extension
- Shut Down of Projects
- Poor Outcome / Poor Achievement of Objectives
- Becomes a National Burden

Government Directives on Feasibility Study

- Projects with estimated cost more than ~~25~~ 50 Crore Taka must be based upon feasibility study (P 12, 4.1).
- Any project that requires ECNEC approval must be based upon feasibility study.
- The Environment Conservation Act 1995 and Environment Conservation Rules 1997 require IEE, EIA and Clearance from Department of Environment for certain types of projects.
- Hydrological and Morphological studies are required for bridges longer than 100 meter.
- Navigation / Vertical clearances are required for bridges following BIWTA requirements.

Examples of Projects with Weak Feasibility Study or Without Study

- Without Feasibility Study: Two Rural Infrastructure Development projects and one Old Steel Bridge Repair / Rehabilitation Project. Consequences include:
  - Project Revision with Significantly Higher Cost
  - New roads required for connectivity
  - New culvert, new protection works requirement etc.
  - Changes from repair to full reconstruction of bridges.
- Projects with weak feasibility study of bridges. Consequences include:
  - Requirement of hydrological and morphological study.
  - Studies conducted after project approval that resulted in change in location, length (in some cases double length required) and revision of projects with significantly higher costs.
  - Another detailed feasibility study needed to be conducted after project approval.
  - In one case after second study it was found that two bridges are required instead of one.

Examples of Projects with Weak Feasibility Study or Without Study

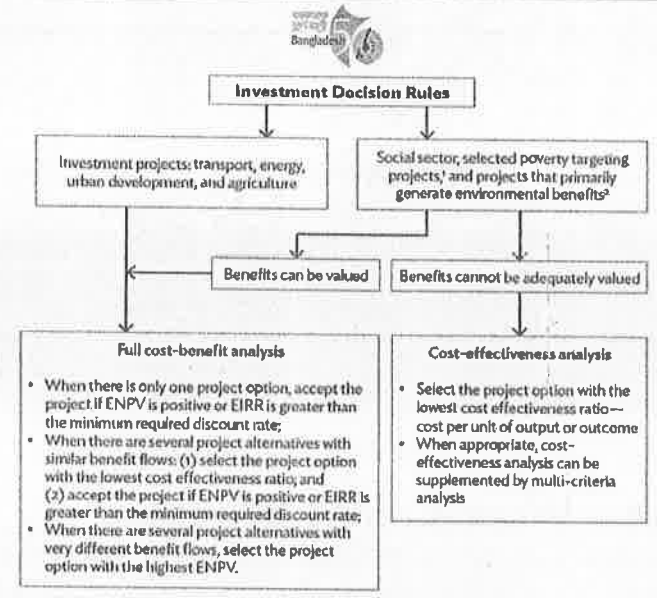
- Urban Roads: City Corporations, various Development Authorities.
  - Roads are repaired or reconstructed without considering drainage system.
  - Without considering any Outfall.
- DPHE and WASA
  - Poor water quality and water logging remains even after projects.
  - (Proper demand analysis in case of water supply, drainage and sewerage system development projects.
  - Underground acquifer condition and water quality should be evaluated in feasibility study.
  - In case of piped water supply motor capacity and energy requirement should be considered
  - Slope, outfall and extent of Drainage and Sewerage system should be evaluated)

Examples of Projects with Weak Feasibility Study or Without Study

Generally:

- Change in location of a bridge after project approval that needs more money.
- Water logging due to road construction.
- Plan to demolish and reconstruct a number of bridges around Dhaka city and throughout the country to ensure vertical clearance (around 800 bridges).
- Roads need to be rebuild due to significant increase in traffic volume (Proper Geometric Design Requirement), poor drainage (Drainage system needs to be addressed), insufficient protection works, side slopes etc.
- A number of schools and other community buildings are being washed away by river erosion.
- A number of projects are running for more than 10 years.

Cost-Benefit Analysis



EIRR = economic internal rate of return, ENPV = economic net present value.
[1] Such as rural roads and rural electrification.
[2] Such as pollution control, protection of the ecosystem, flood control, control of deforestation, and disaster risk management.
Source: ADB Economic Research and Regional Cooperation Department.

A Decision Making Tool to Evaluate Financial and Economic Feasibility of a Project

ADB - Feasibility Study book. (adb.org)

CBA

- Cost-Benefit analysis considers life-cycle costs and life-cycle benefits of the project alternatives under study. The analysis reveals the financially and economically efficient investment alternative, i.e., the one that maximizes the net benefits to the project authority and / or to the society from an allocation of resources. The life-cycle costs include design and engineering costs, land procurement costs (if required), utility relocation costs (if required), infrastructure construction cost and maintenance costs, necessary equipment costs and O&M costs. Life-cycle benefits considers any direct financial benefits and economic benefits resulted from the operation of the project.

CBA

Costs	Benefits
Planning Construction Operation Maintenance	Direct Benefits Indirect Benefits

Financial Analysis

- Direct Benefits such as toll earnings (revenue) from a bridge

Economic Analysis

- Indirect Benefits such as social benefits – vehicle operating cost savings for a new road

CBA

Analysis Period: Number of years

- For uncertainty, longer periods may be avoided.
- Design Life, or higher time period:
  - Example A new highway – 20 years

Present value = (Value in Year t)*[1/(1+r)^t]

- r is the discount rate (discounting the future value)
- t is the number of years into the future that the cash flow occurs

Discount Factor

- 1/(1+r)^t is known as discount factor

- In the case of 12% rate and one year (after 1 year or in 2nd year)
  - Discount factor = 1/(1+0.12)^1 = 0.892857

- In the case of 12% rate and two years (after 2 years or in 3rd year)
  - Discount factor = 1/(1+0.12)^2 = 0.797194

- In the case of 12% rate and three years (after 3 years or in 4th year)
  - Discount factor = 1/(1+0.12)^3 = 0.71178

CBA: Results of Analysis

- The economic or financial outcome parameters that are obtained from the analysis are as follows:

- Net Present Value (NPV)
- Benefit Cost Ratio (BCR)
- Internal Rate of Return (IRR)

CBA: Results of Analysis

- Net Present Value
  - Difference between discounted benefits and discounted costs.
- Benefit-Cost Ratio
  - It is the ratio of the discounted benefits of a project over its discounted costs
- If BCR > 1, Project is beneficial or feasible
- If BCR < 1, Project benefits will be lower than its costs – not feasible (?)
- Sometimes, financially BCR < 1, but economically BCR >1
- What to do?

Internal Rate of Return: IRR

- Internal rate of return (IRR) is the discount rate at which the present value of benefits become equal to the present value of costs.
- The higher the IRR on a project, and the greater the amount by which it exceeds the cost of capital, the higher the net cash flows to the investor.
- The IRR measures how well a project, capital expenditure or investment performs over time. The internal rate of return has many uses. It helps companies compare one investment to another or determine whether or not a particular project is viable

Internal Rate of Return: IRR

$$IRR = LRD + \left[\frac{NPV_{LRD}}{NPV_{LRD} - NPV_{HRD}}\right] * [HRD - LRD]$$

LRD = Lower discount rate at which NPV is positive
HRD = Higher discount rate at which NPV is zero or negative

Example: Case Study

New Road.		
Length =	10	km
Lane No. =	4	
Cost /Km=	15	Cr Tk/Km
Const. Cost=	150	Cr
Admn Cost=	30	Cr
Toal=	180	Cr

Per Capita GDP 2019 Nominal	
1906	USD
162010	BDT
621.4082	BDT per 8 Hrs
77.68	BDT per Hr
1.2946	BDT per Minute

Vehicle Type	Before	After	Saving	VOC Savings
	Fuel Liter	Fuel Liter	Liter	Tk
Passenger Car	1.75	1.11	0.64	56.96
Bus	-	,-	1.00	60.00

Vehicle Type	Occupancy	TT Before	TT After	TT Savings	VOT Savings
	Person	Minutes	Minutes	Minutes	Tk/Person
Passenger Car	2	40	15	25	32.37
Bus	40	40	20	20.00	25.89

Example: Case Study

	Car Volume	Passenger	Bus	Passenger
Per Hr	120	240	16	640
Per Year	924000	1848000	123200	4928000
Million	0.924	1.85	0.12	4.93
VOC Sav Mill Tk	52.63	-	7.39	-
VOT Sav Mill Tk	,-	59.81	,-	127.60

Example: Case Study

Number of Years	Year	Construction Cost [Lakh Tk]	O & M Cost [Lakh Tk]	Total Cost Lakh Tk	AADT Lakh	VOC Saving Lakh Tk	VOT Saving Lakh Tk	Total Savings Lakh Tk
1	2020	8000.00	0.00	8000.00				
2	2021	10000.00	0.00	10000.00				
3	2022	0	10.00	10.00	10.47	600.2304	1874.06	2474.29
4	2023	0	10.50	10.50	11.52	660.25	2061.47	2721.72
5	2024	0	11.03	11.03	12.67	726.28	2267.62	2993.90
6	2025	0	11.58	11.58	13.94	798.91	2494.38	3293.29
7	2026	0	750.00	750.00	15.33	878.80	2743.82	3622.61
8	2027	0	12.73	12.73	16.87	966.68	3018.20	3984.88
9	2028	0	13.37	13.37	18.55	1063.34	3320.02	4383.36
10	2029	0	14.04	14.04	20.41	1169.68	3652.02	4821.70
11	2030	0	14.74	14.74	22.45	1286.65	4017.22	5303.87
12	2031	0	15.48	15.48	24.69	1415.31	4418.94	5834.26
13	2032	0	3750.00	3750.00	27.16	1556.84	4860.84	6417.68
14	2033	0	17.03	17.03	29.88	1712.53	5346.92	7059.45
15	2034	0	17.88	17.88	32.87	1883.78	5881.61	7765.39
16	2035	0	18.77	18.77	36.15	2072.16	6469.78	8541.93
17	2036	0	19.71	19.71	39.77	2279.37	7116.75	9396.13
18	2037	0	1500.00	1500.00	43.74	2507.31	7828.43	10335.74
19	2038	0	20.70	20.70	48.12	2758.04	8611.27	11369.31
20	2039	0	21.73	21.73	52.93	3033.85	9472.40	12506.25
21	2040	0	22.82	22.82	58.22	3337.23	10419.64	13756.87
22	2041	0	23.96	23.96	64.05	3670.95	11461.60	15132.56
	Total	18000.00	6276.05	24276.05	599.78	34378.20	107336.99	141715.19

Example: Case Study

Discount Factor 12%	Disc Cost Lakh Tk	Disc Benefit Lakh Tk	Discount Factor 20%	Disc Cost Lakh Tk	Disc Benefit Lakh Tk
1.0000	8000.00	0.00	1.0000	8000.00	0.00
0.8929	8928.57	0.00	0.8333	8333.33	0.00
0.7972	7.97	1972.49	0.6944	6.94	1718.26
0.7118	7.47	1937.27	0.5787	6.08	1575.07
0.6355	7.01	1902.67	0.4823	5.32	1443.82
0.5674	6.57	1868.70	0.4019	4.65	1323.50
0.5066	379.97	1835.33	0.3349	251.17	1213.21
0.4523	5.76	1802.56	0.2791	3.55	1112.11
0.4039	5.40	1770.37	0.2326	3.11	1019.43
0.3606	5.06	1738.75	0.1938	2.72	934.48
0.3220	4.75	1707.70	0.1615	2.38	856.60
0.2875	4.45	1677.21	0.1346	2.08	785.22
0.2567	962.53	1647.26	0.1122	420.59	719.79
0.2292	3.90	1617.84	0.0935	1.59	659.80
0.2046	3.66	1588.95	0.0779	1.39	604.82
0.1827	3.43	1560.58	0.0649	1.22	554.42
0.1631	3.22	1532.71	0.0541	1.07	508.22
0.1456	218.47	1505.34	0.0451	67.61	465.87
0.1300	2.69	1478.46	0.0376	0.78	427.04
0.1161	2.52	1452.06	0.0313	0.68	391.46
0.1037	2.37	1426.13	0.0261	0.60	358.83
0.0926	2.22	1400.66	0.0217	0.52	328.93
	18567.98	33423.06		17117.38	17000.86

At	12%	At	20%
NPV	14855.07	NPV	-116.52
BCR	1.80	BCR	0.9931929
		IRR	19.94%

Example: Case Study

Number of Years	Year	Construction Cost (Lakh Tk)	O & M Cost (Lakh Tk)	Total Cost Lakh Tk	AADT Car Lakh	AADT Bus Lakh
1	2020	8000.00	0.00	8000.00		
2	2021	10000.00	0.00	10000.00		
3	2022	0	10.00	10.00	9.24	1.23
4	2023	0	10.50	10.50	10.16	1.36
5	2024	0	11.03	11.03	11.18	1.49
6	2025	0	11.58	11.58	12.30	1.64
7	2026	0	750.00	750.00	13.53	1.80
8	2027	0	12.73	12.73	14.88	1.98
9	2028	0	13.37	13.37	16.37	2.18
10	2029	0	14.04	14.04	18.01	2.40
11	2030	0	14.74	14.74	19.81	2.64
12	2031	0	15.48	15.48	21.79	2.90
13	2032	0	3750.00	3750.00	23.97	3.20
14	2033	0	17.03	17.03	26.36	3.52
15	2034	0	17.88	17.88	29.00	3.87
16	2035	0	18.77	18.77	31.90	4.25
17	2036	0	19.71	19.71	35.09	4.68
18	2037	0	1500.00	1500.00	38.60	5.15
19	2038	0	20.70	20.70	42.46	5.66
20	2039	0	21.73	21.73	46.70	6.23
21	2040	0	22.82	22.82	51.37	6.85
22	2041	0	23.96	23.96	56.51	7.53
	Total	18000.00	6276.05	24276.05	529.22	70.56

Example: Case Study

Toll Car @ Tk 40	Toll Bus @ Tk 80	Toll : Total Lakh Tk	Discount Factor 12%	Disc Cost Lakh Tk	Disc Benefit Lakh Tk
			1.0000	8000.00	0.00
			0.8929	8928.57	0.00
369.60	98.56	468.16	0.7972	7.97	373.21
406.56	108.42	514.98	0.7118	7.47	366.55
447.22	119.26	566.47	0.6355	7.01	360.00
491.94	131.18	623.12	0.5674	6.57	353.58
541.13	144.30	685.43	0.5066	379.97	347.26
595.24	158.73	753.98	0.4523	5.76	341.06
654.77	174.61	829.37	0.4039	5.40	334.97
720.25	192.07	912.31	0.3606	5.06	328.99
792.27	211.27	1003.54	0.3220	4.75	323.11
871.50	232.40	1103.90	0.2875	4.45	317.34
958.65	255.64	1214.29	0.2567	962.53	311.68
1054.51	281.20	1335.72	0.2292	3.90	306.11
1159.96	309.32	1469.29	0.2046	3.66	300.65
1275.96	340.26	1616.22	0.1827	3.43	295.28
1403.56	374.28	1777.84	0.1631	3.22	290.00
1543.91	411.71	1955.62	0.1456	218.47	284.83
1698.30	452.88	2151.18	0.1300	2.69	279.74
1868.13	498.17	2366.30	0.1161	2.52	274.74
2054.95	547.99	2602.93	0.1037	2.37	269.84
2260.44	602.78	2863.22	0.0926	2.22	265.02
21168.84	5645.02	26813.86		18567.98	6323.96

At	12%
NPV	-12244.02
BCR	0.34

Concluding Remarks

- Components of Feasibility Study may vary with project type.
- Technical Analysis is an integral part of Feasibility Study (Example: Demand Forecasting, Geometric Design of Pavements, Location etc.)
- Proper Feasibility Study plays significant role in designing and implementing any project.
- Proper Feasibility Study may ensure achievement of project's planned outcomes.
- Proper Feasibility Study may ensure in-time completion of projects.
- There are other factors that may influence smooth and successful implementation of any project. Among these qualified full-time project director, required allocation and flow of funds are significant factors.

Thank You