↗ cater arvices to some section of people.

Infrastructure v/s service ⇒ Infrastructure is made to provide services by govt.

eg- Housing Infrastructure for poor people - govt not paid for it
Houses made by yourself. - ✗ infrastructure

∴

2 - Planning process of large scale Infrastructure :-

- Goals of any Infrastructure ⇒ common to central govt., state govt & urban local body. (ULB)
- Eg of Infrastructure ⇒ Healthcare Infrastructure, Transportation Infrastructure, Academic Infrastructure, Airport Architecture, Education Infrastructure
- Infrastructure → Transportation - objective to shift people to ~~privat~~ public transportation

Determination of Alternatives - ~~more tax on petrol~~ ~~less road tax on EV~~ ~~Airconditioned Batteryoperated bus~~

Project Scenario 0 - no improvement in bus service (existing bus service only)
low fare " " 1 - Introduction of CNG Buses (People caring about environment & due to less price)
High fare " " 2 - BOV with air conditioned services
" " 3 - Introduction of 3 coaches light rail transit ~~(Articulated Bus)~~
" " 4 - monorail. ~~NPV's Bus~~ ~~Amphibian bus~~ (elevated bus system)

① ⇒ less fare. , people - environment friendly prefer this ∴
② ⇒ High fare, warranty of getting seat due to less crowd
③ ⇒ No delay , no noise. , ∴ with AC
④ ⇒ capacity - less than ③

Limitations

③, ④ – high investment needed, more land to acquire / occupy high fare ⇒ no Investors to invest

- Feasibility Analysis – done for all projects
  - → land use & Demographic analysis
  - → financial analysis
  - → economical impact
  - → technical analysis
  - → environmental impact analysis

→ Technical analysis

for monorail – very costly, more technical expertise needed

Lightrail – less costly than monorail & comparatively less technical expertise needed

BOV/CNG Bus – less costly & less technical expertise needed

→ Environmental impact analysis

①, ②

③, ④ – no emission but for electricity generation – emissions

→ Financial feasibility – investors want profits

↓ connect to consulting firms to take decision for investing

⓪ – no initial investment, only maintainance

② – initial " , maintainance cost high

③, ④ – huge " " , " " very high

→ Economical impact analysis (benefit for users)

~~preferred~~

~~③ → ②~~

- based on income, etc.
- subjective – vary person to person
- benefit analysed – if no benefit – infrastructure not adopted

Benefits to user – security, safety, comfort

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→ Land use & Demographic analysis

③, ④ - more land to acquire - not feasible

⓪, ①, ② - no land acquiring needed

apsara

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- major points of comparison b/w project scenarios

① Fare (User charges)
② Reliability of travel time (Buses coming on time) • cost
③ Ambience of Inside mode (comfort Inside)
④ Crowding Level / Standing condition (Improvement in)
⑤ Accessibility to access the mode
⑥ waiting time at transit stop
⑦ Intial capital outlay
⑧ maintenance & operating organization cost

	Current Bus Scenario	CNG Bus Scenario	Electric Bus Scenario	LRT Scenario	monoRail Scenario
①	✓✓✓	✓✓✓	✓	✓✓✓	✓✓✓
②	✓	✓	✓ (% of limited stops - better)	✓✓ (more regular on time)	✓✓
③	✓	✓	✓✓	✓✓✓	✓✓✓
④	✓	✓	✓✓	✓✓✓	✓✓✓
⑤	✓✓✓ (accessible from anywhere)	✓✓✓ (accessible from anywhere)	✓✓✓ (accessible from anywhere)	✓ (not accessible from anywhere)	✓ (not accessible from anywhere)
⑥	✓✓ (frequency high - more Buses available one after another - easily can get bus)	✓✓ (frequency high - more Buses available one after another - easily can get bus)	✓ (Operating cost - high - can't introduce many buses)	✓	✓
⑦	NULL.	✓✓ less.	✓ Higher	✓ High	✓ very high.
⑧		✓✓ less	✓✓	✓ High.	✓

Q- Difference b/w financial analysis & economic analysis in Infrastructure project

Financial Analysis	Economical Analysis
→ deals with project cost	→ related to the impacts of projects on user - benefit they get
→ maintenance & operational cost included	

Includes

Initial capital outlay

maintenance & operating cost

Includes

Fare,

Reliability of travel time,

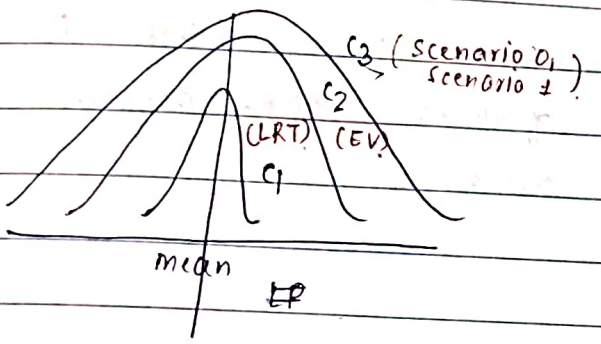
Ambience of inside mode.

Crowding level

Accessibility

Waiting time

(*) Reliability of travel time



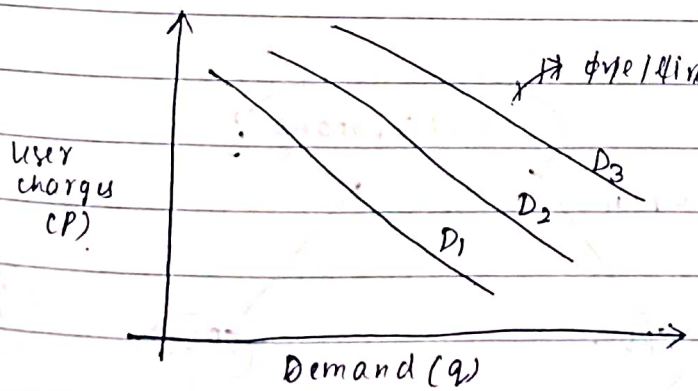
LRT - Light Rail Transit - more reliable. (can believe that it will come on time)

Analysis. Done by different organization

Govt - Economical Analysis

Investors - Financial Analysis

(*) User charges v/s Demand



each demand curve - represents particular segment of society (economic background)

WTP - willingness to Pay - max price that customer is willing to pay for a product/service ⇒ represents demand curve of a section

WTP of for different segments of society $P_3 > P_2 > P_1$

↓

socio-economic background of segment

P_1 inferior to P_2 inferior to P_3

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D_1, D_2, D_3 – WTP for various segments of socio-economic background

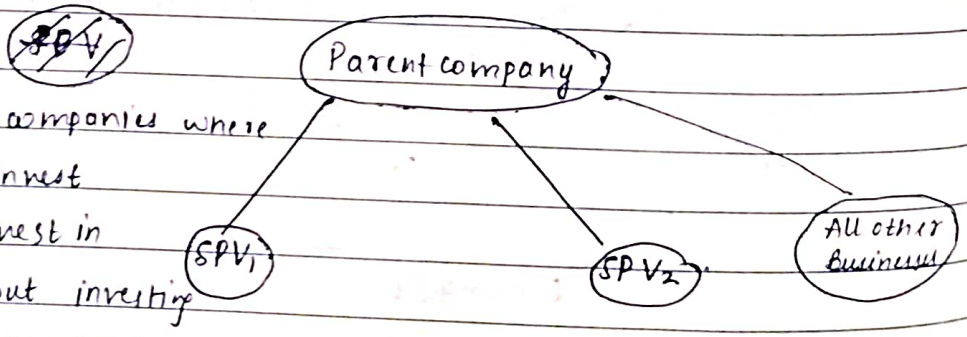
- WTA – willingness to accept – min. amount that a person is willing (seller side/service provider related) to accept to sell a good/service (minimum amount below which service provider is not willing to provide infrastructure)

SPV – Special Purpose Vehicle – subsidiary company (company controlled by another company) that is formed to undertake special business purpose/activity

eg – CRUT (Capital Region Urban Transport) – public special purpose vehicle formed under Housing & Urban Development Department of Odisha – mobw operation in Bhubaneswar, Cuttack etc

TRAI – Telecom Regulatory Authority of India – (decides the max user charges for telecom, internet services)

WTA < Price/User charges < WTP ⇒ Fare/user charges decided this way in ~~market~~ ~~required~~



SPV – subsidiary companies where investors can invest separately invest in SPVs without investing in parent company

→ legal, separate entity where parent company is not holding any financial risk of SPVs, after finite time. SPVs pay parent company some revenue like exemption of direct tax, parent company may transfer some assets to SPV

→ direct taxes not paid by SPVs, SPVs meant for special purpose

Financial Analysis → contain ways & mean of funding
→ revenue generation

* In case of financial analysis ways & means to fund Infrastructure project
  - Govt. funding – partial / complete funding given depending on revenues it is generating and purpose of it.
    eg- Govt Healthcare – completely funded by govt. (grant money (paying money but not asking with interest))
    Bridges – partially funded by govt. & partially by other investors
  - financial analysis include Revenue generation, Initial cost overlay, operational cost, maintenance cost

* Economic Analysis

⇒ eg- Expansion of 2 lane → 4 lane highway

⇓

Benefits to people.

- travel time decrease. mobility ↑.
- priced farms near by main ~~round~~ road ↑.
- easy for farmers to navigate from villages to cities
- enhancement of road safety

⇒ value of time – different for different segments of people.
eg – delay of flight, airline pays for compensation of time- different amount to different classes

⇒ Economic value of attribute – under economic analysis

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* Financial & Economic Analysis in setting up electricity at hilly areas

Financial Analysis - Initial cost overlay - setting up transmission tower & lines

operating & maintainence cost -

Economic Analysis -. of night - academics is better, travelling better

safety & security ↑.

* PPP - Public Private Partnerships

Initial investment / overlay by private institutions and then later handed over to government

eg - BOOT - Build own operate transfer.

BOT - Build operate transfer.

BLOT - Build Lease Operate Transfer.

private contractor builds on leased land

opirates for duration of lease and then

transfer of govt.

BOO - Build own Operate.

DEMAND ANALYSIS

Previous Demand Data.

Duration of project operation

Projection of Demand Data

↓

Initial cost Overlay.

⇒ Challenges in Demand Estimation :- ① plausible fare/user. charges service airfare are estimated by models. (eg - in Airline infrastructure.)

② power usage of a family having 2, 4, 5, 6... members estimated by models in power supply infrastructure - estimation of no. of 2 member families, 4... in future ⇒ estimate future power.

③ wireless service. - demand estimation of future internet users (updating from 2G → 4G, 4G → 5G)

⇒ Demand estimation is done - for as long as the project is to be operated

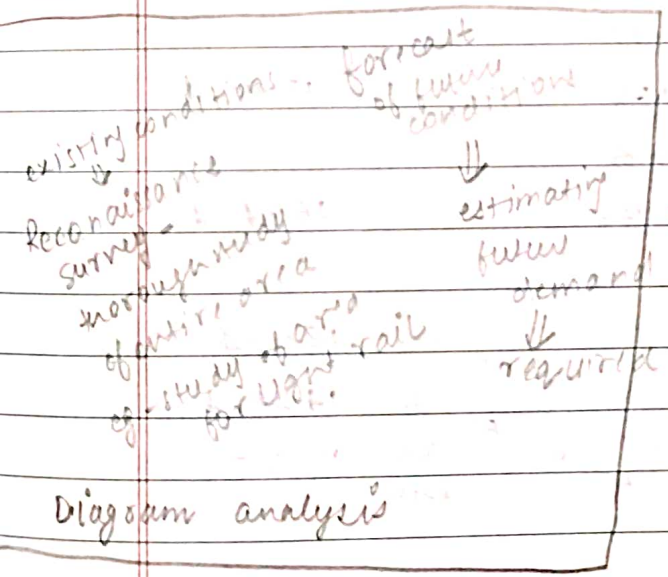


Diagram analysis

- Historical Data (Reconnaissance study)

Time (t)	Actual usirs
t_1	y_1
t_2	y_2
⋮	⋮
t_{10}	y_{10}

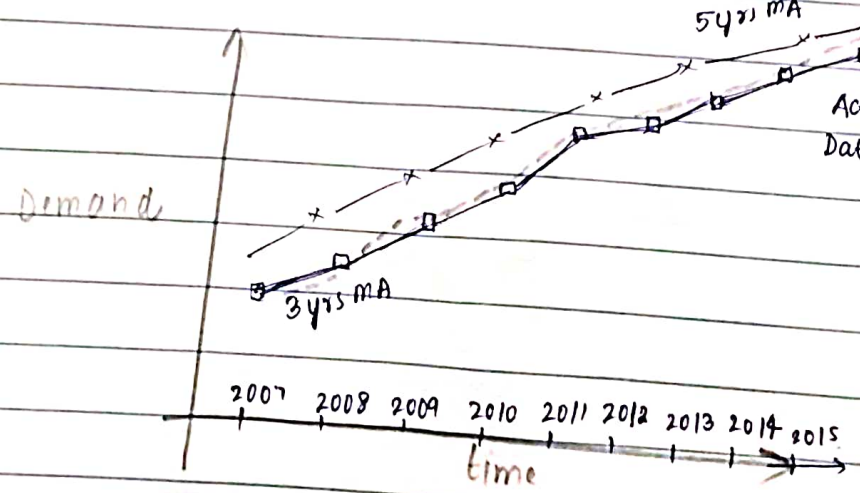
for complete duration of project operation

⇓

knowing growth ⇒ future demand can be predicted by exponential model, constant model, quadratic model etc. - Modelling Techniques + Historical data ⇒ both determine accuracy of predictions

- Data → Primary : (collecting data from surveys - direct interviews) eg-census data collection one to one.
  → secondary (Directly collected from govt. offices / or any other sources)

Obs	t_i	P_i	3 years moving Avg.	5 years moving Avg
1	2007	1436		
2	2008	1500	1492.	
3	9	1540	1546.6	
4	10	1600	1590	1541.6
5	11	1632.	1677.33	
6	12	1680	1733.33	1590.4.
7	13	1720	1778.33	
8	14	1800		1634.4
9	15	1815		
				1686.4
				1729.4
				1777.7



Here 3 yrs MA prediction $\xrightarrow{\text{accurate}}$ 5 yrs MA prediction

∞ predicts next year better

3 yrs MA - predicts data for 2016, 2017....

But 5 yr MA - overestimating next year's data.

Predictions

Short term predictions
(no drastic change in govt policies & people's opinions)

simplified model can be used.

Long Term Predictions
(difficult to predict accurately as govt change.)