

Need: Cities have limited transport zones historically fixed and do not expand or cannot be expanded because of built up habitats and businesses, to meet fast growing needs of urban population. Road based systems have low lineal density and quickly get saturated. The rail based system with high lineal density in capacity, and being rail guided can provide for automated fast transportation, but needs to be flexible to follow existing roads both in line and level to be economical and non-invasive to cause little damage to existing businesses and habitats.

Ideal requirements: We desire for a system is capable of the meeting following requirements.

1. Follow the same right of way as existing roads either elevated or sub-way- and not requiring tunneling.
2. No large stations, but easy access from existing foot paths- rate of inflow to be matched by rate of servicing
3. No noise pollution nor any chance of collateral damage if failure occurs on the system while the system should satisfy the prescribed safety norms under UIC/ Indian Rly codes and regulations.
4. The rolling units and rail guidance such that no separation can take place, and there should be no capsizing of the module carrying passengers.
5. There should be no chance of getting stranded of a coach in between stations, no sudden power failures.
6. There shall be no possibility of collision between the units to endanger lives.
7. The entire existing road traffic should remain unhindered
8. Not a single habitat or business should need relocation.
9. Environmental friendly energy consumption thus reducing global warming
10. Level of service:
  1. Air-condition and high speed 100 kmph max speed
  2. Access should be within 250m from any point on the road and in any case nor more than 500m within the city.

Current rail based solutions do not satisfy all these requirements.

Gravity Power Towers:

Gravity Powered Urban Mass Rail transportation system meets all these requirements with scalable capacity and can take grades too, because it does not depend on rail/wheel adhesion for traction. The details are described in another technical paper with drawings. The estimates covering the cost of a typical project for a city of route length of 100km , operation, maintenance, interest and depreciation amounts, the expected revenues at 50ps per km and the expected profits are worked out.

**Energy saving compared to current mode is 94%** which is because we are tapping the alternate source of gravity power and the profits for a commercial venture can be of the order of 50% as ROC, after debt servicing and meeting all expenses including provision for depreciation.

<b>Gravity Powered Mass urban transportation at 100 kmph for typical 100 km route in India on Skywheels based railway</b>								
<b>Implementation : route of</b>		100 km						
<b>Parameters</b>		<b>Max Speed</b>		<b>108 Kmph</b>		<b>1039.65 m.passenger capacity both ways per annum.</b>		
<b>Automated Driving &amp;Control: Absolute Block System: only one rolling module per one driving cable between two GP Towers, spaced at 500 m.</b>								
		Unit Cost in		Annual OM	Depreciation	Annual O&M,		
		Rs	cr	Cost Rs Cr	%	%	Depreciation	
<b>GP Towers</b>		222						
	Structure	0.3		66.67	2.00%	2.00%	2.67	
	CV gear system	0.2		44.44	5.00%	5.00%	4.44	
	Embedded intelligence	0.4		88.89	5.00%	10.00%	13.33	
	Cables	0.1		22.22	10.00%	20.00%	6.67	
<b>Rail guidance track</b>								
	Includes							
	interfacing with road transport	New route km double line Skwheels based	100	40	4000	5.00%	5.00%	
							400	
<b>Rolling stock</b>								
	New stock							
	Skywheels based	450	0.5	225	5.00%	10.00%	33.75	
<b>Total cost of project, O&amp;M, depreciation, interest charges Energy,</b>							Total expenses incl interest, O&M, Depreciation In Rs crores	Cost per seat.km
	New One	4447.22		O&M +Depreciation 460.86	Interest 444.72	Energy* 394.6	1300.19	0.01 Rs/seat.km
<b>Headway</b>		20						
	Throughput units/dk:	3600 Capacity for unit is @ 7/sq.m		401.1 passenger capacity per unit				
	At 55 t/unit	519.83 Million passenger seats per annum per direction						
20 hr day and 360 day year taken.								
	*The system if run with stops every 450m; 54 kmph speed then the energy cor						6.57 Kwh per 1000gtkm	
	Current IR system consumes.....						114 Kwh per 1000gtkm	
	Saving in energy .....						94%	
	Annual energy consumption to be paid for.....						0.94 Million Mwh	
	At Rs 4.21 per unit it means 3946.04 m Rs.							
<b>Revenue, expenses profits</b>								
	Revenue @0.50Rs/km	Rs	3638.78 cr		0.5 Rs/.km for passenger. Km, @ 70% of capacity used			
	<u>Net Profit for New route</u>		<u>2338.59 cr</u>		<u>52.59%</u> for new rolling stock			

**Notes:**

1. A rolling module is 3.5mwide x 20m long and at 7m/sq.m can carry 400 persons standing.
2. Headway of 20 sec is such that when one unit gets serviced at a station, the service time being 20 sec, another would be arriving to take its place. The access from vertical lifts of high capacity also driven by gravity power tower, can feed/evacuate at 400 persons per 15 seconds.
3. The revenues worked out assuming 70% of utilisation of capacity in terms of passenger.km , even if it falls by 50%, then also 25% profit is assured.
4. The costing is based on 50% being a sub-way ( cut-cover close to road surface) and rest elevated system- there is no tunneling.