International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 10 Oct. 2022, pp: 770-783 www.ijaem.net ISSN: 2395-5252

Hyperloop (HL) implementation in India: A study on Cost Volume Profit (CVP) analysis on proposed hyperloop project in India.

Anupa Francis Dungdung[1], Gobinath N M[2], Dr. Matha Rajesh[3]

[1,2]*II PGDBM, Xavier Institute of Management and Entrepreneurship, Chennai, India*
[3]*Assistance Professor, Xavier Institute of Management and Entrepreneurship, Chennai.*

Date of Submission: 05-10-2022 Date of Acceptance: 15-10-2022

ABSTRACT: This article was inspired by the hyperloop technology proposed by Elon Musk, 2013. The research paper focuses on the advantage and disadvantages of implementing hyperloop in Indian cities and how this will make an impact in supply chain and logistic sector, and also in healthcare management. We discussed the implementation of Hyperloop globally (mainly focused in India). Also, it mentioned that if Hyperloop is implemented between Chennai to Bangalore, then what will be the cost of implementation and how we can achieve a break-even point and What has changed between the current transportation system and that one? (Mainly prize and time). In this paper we discussed whether hyperloop is the right alternative means of transportation or not.

KEYWORDS: Hyperloop, Virgin Hyperloop, Break-even point, high speed transportation, Supply chain, CVP analysis,
Paper Type: Viewpoint.

I. INTRODUCTION

The transport system plays an integral role in its growth for a large number of reasons. It supports the fast and simple movement of equipment, finished goods, raw materials, etc., which benefits industry. A good transportation system will broaden the size of the market for products.

Elon Musk, the creator of PayPal, SpaceX, and Tesla, presented a unique transportation system with the name "Hyperloop" at a press conference in August 2013. Since 2013 several private businesses have been founded for the development and marketing of Hyperloop-based systems. Interestingly, Musk does not want any license fees on the proposed technology ("open source" concept). In anticipation of the use of this ultra-high-speed transportation system, many nations have started to build. Hyperloop (HL) is presented as an efficient alternative of High-Speed Rail and Air Passenger Transport systems for long-distance passenger transport.

Similar to pneumatic mail, the fundamental concept underlying hyperloop is that capsules or pods are shot at great speed (more than 1000 km/h) through an almost-vacuum-like tube. There are two possible configurations of this capsules namely passenger-only version, passenger version with a vehicle. In addition to speed, the hyperloop also seeks to be environmentally beneficial. To run the hyperloop exclusively on renewable energy is the company's aim.

II. REVIEW OF LITERATURE

Shubham Parsoya (2022) says that in the near future, such innovation like hyperloop technology make it very simple to transport form anywhere to everywhere from their home.

In this article author says that Innovation and advanced transportation system will provide great opportunity in future with great economic profit.

Jonas kristiansenNøland, (2021) says about Effective levitation & propulsion methods that work with the suggested velocities are required. The HTS design has a number of

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 10 Oct. 2022, pp: 770-783 www.ijaem.net ISSN: 2395-5252

competing goals that have been noted. Aiming for a lightweight vehicle and a passive track design that is inexpensive is another challenge. As an alternative, the vehicle might be upgraded to become a "modified aeroplane" with enormous on-board energy storage, creating an energy-autonomous "low infrastructure option" (LIS).

The Hyper Loop Transportation System (HTS) was thoroughly examined in this paper by examining its technical viability across a range of academic disciplines and specialties. The essay also discusses the prospects and existing difficulties related to the two most promising technical options, namely the lightweight capsule solution and the low infrastructure solution (LIS) (LCS). Future research should concentrate on investigating the most promising HTS platform alternatives at a detailed level of performance. Further research of the proposed solutions' energy consumption costs under operation in light of the costs incurred for the infrastructure investment is also necessary.

E.E. Dudnikov, (2017) author focuses on 20-foot shipping containers using Hyperloop cargo systems. Russia is currently planning to construct such a transportation infrastructure in the Far East. The author of the research looked at the technical specifications of the tube and capsule for the Hyperloop cargo systems and provided some estimations for technical and economic variables like building costs and road carrying capacity. It also discusses the advantages of using Hyperloop as a form of transportation. A few of them are the Hyperloop system's great carrying capacity, ability to move people and goods at very high speeds, ecological cleanliness, and a host of others.

Catherine L. Taylor, et.al (2016) the authors have highlighted that the hyperloop technology is promoted as having very rapid speeds, quicker than existing modes of passenger travel, and as being able to deliver that service at a lesser cost than high speed rail. This is from the perspective of Commercial Potential-Passenger (HSR). In fact, the maximum and average speed estimates for the Hyperloop are quicker than those for air, maglev, and HSR. The time saved over using air or maglev would be about 45 minutes for a 400-mile travel between San Francisco and Los Angeles.

According to the authors' analysis of the commercial potential for freight, the current market for air freight, which accounts for just 2 percent of tonne miles but 40 percent of freight value, would likely be interested in the high speeds afforded by the hyperloop.

The authors drew attention to the fact that, despite the marginally greater speeds offered by hyperloop, there are already established technologies that provide nearly identical results at lower costs.

Elon Musk, (2013) described the proposal of Hyperloop as an ultra-high only speed transportation system. The purpose of this transportation system was to transport people from San Francisco to Los Angeles in California (USA). With this technology, a capsule moves down the tube at a speed of 1220 kmph, covering the distance of 561 kilometres in roughly 30 minutes.

III. UNDERSTANDING HYPERLOOP AND ITS IMPLEMENTATION GLOBALLY AND IN INDIA

One of those highly anticipated and potentially revolutionary new transportation technologies is the hyperloop. The initial design of the hyperloop was for pods to travel at a top speed of 1220 km/h over a network of tubes in a low-pressure environment. The key benefit of the Hyperloop, aside from speed, is that the partial vacuum reduces drag, which results in less energy being used during acceleration and cruise. Engineers and venture capital funds were combined by a number of US businesses to conduct research and development to bring the Hyperloop concept to life. Later, the same businesses extended to Europe, and additional businesses there also engaged in comparable activities, including as the building of Hyperloop test sites. Numerous projects have been offered by many companies like Virgin Hyperloop, Hyperloop Transportation Technologies in India. (Gkoumas, 2021)

Every nation has its own hyperloop project. After Richard Branson's Virgin Hyperloop, the leading companies include Hyperloop Transportation Technologies in the US, Trans pod, a Canadian-French company, and Zeleros in Spain. startup situated in Valais Swiss pod is also developing a prototype for a capsule that would take people from Zurich to Geneva in under 17 minutes. (Chauvet, 2021)

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 10 Oct. 2022, pp: 770-783 www.ijaem.net ISSN: 2395-5252

VARIOUS UPCOMING HYPERLOOP PROJECTS GLOBALLY:

	Distance (in km)	Centers		
Chicago-Columbus-Pittsburgh (US)	785	3	13,800,000	Midwest Connect
Bengaluru-Chennai (India)	334	6	17,710,000	AECOM India
Dallas-Laredo-Houston (US)	1030	5	18,771,000	Texas Triangle
Cheyenne-Denver-Pueblo (US)	580	10	4,831,000	Rocky Mountain
Edinburgh-London (UK)	666	4	19,151,514	HypED
Miami-Orlando (US)	414	2	8,500,000	Miami/Orlando Hyperloop
Glasgow-Liverpool (UK)	545	6	9,715,483	Northern Arc
Mexico City-Guadalajara (Mexico)	532	4	33,530,000	Mexloop
Toronto-Montreal (Canada)	640	3	13,326,000	HyperCan

Source: (Ghoshal, 2017)

Status of hyperloop in India

A high-level team has been created by the government think tank NITI Aayog to examine the technological and commercial viability of Hyperloop technology for ultrahigh-speed transport in India. In July 2017 NITI (National Institution for Transforming India) Aayog approved 6 proposals such as hyperloop, metrino, pod taxis, Stadler buses, hybrid buses and freight railroad.

IIT MADRAS study found that, tie up on metropolis roads prices around $10 billion or concerning Rs. 60000 crores annually as a result of fuel waste due to the utilization of vehicles, which will ultimately be enhancing level of pollution in the environment.

Currently, the following routes have been proposed for putting the Hyperloop concept into practise in the Indian Subcontinent. Several of these routes are now being tested for viability and have already been shown to be so. Most of these initiatives will be carried out as joint ventures between the Indian government and for-profit companies like Hyperloop Transportation Technologies, Hyperloop One, etc. It should be emphasised that the suggested routes have considered people's willingness and the potential for a significant improvement in their lives.

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 10 Oct. 2022, pp: 770-783 www.ijaem.net ISSN: 2395-5252

Starting Station	Ending Station	Distance (KM)	Time(mins)
Mumbai	Pune	160	13
Bengaluru	Chennai	334	21
Bengaluru	Thiruvananthapuram	736	41
Mumbai	Chennai	1100	50
Delhi	Mumbai	1317	55
Vijayawada	Amravathi	42	5

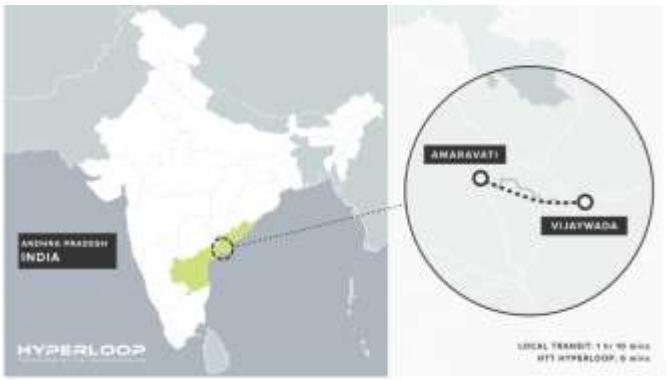
Hyperloop upcoming projects in different states in India

Vijayawada and Amaravati Hyperloop Project

In September 2017, Andhra Pradesh signed a Memorandum of Understanding (MoU) with Hyperloop Transportation Technologies (HIT) for developing the project. The proposed Hyperloop will cover distance between Vijayawada and Amaravati within 6 minutes.

According to HTT, this arrangement is the first of its kind for a Hyperloop line in India, and it will result in the creation of 2,500 jobs.

During the initial phase, HTT will work with both public and private partners to determine the best route to connect the two cities while keeping the positions of surrounding cities in mind and other issues. The Andhra Pradesh Economic Development Board will support in negotiating regulatory processes to guarantee that the initiative receives official government backing. The state wants to use the Hyperloop to assist Amaravati become a center for technology and software development and to generally raise living standards in the region. (D. Etherington, Sept,2017)



Mumbai - Pune HL Project

In February 2018 Maharashtra signed a MoU with Virgin group to build an Hyperloop connecting Mumbai and Pune reducing travel time from 3 hours to just 25 minutes.

Virgin Hyperloop and the Maharashtra government signed a contract to build an Hyperloop transit system between Pune and Mumbai. The futuristic, still-under-construction Hyperloop has been designated as a "public infrastructure project" by the state of Maharashtra. As a result, India would acquire the first Hyperloop train that is completely operational. With the Hyperloop train, the current three to four-hour travel from Mumbai to Pune could be completed in 23 minutes. From Mumbai's Bandra Kurla Complex (BKC) to Pune's Wakad, it will go 117.5 kilometres. (India will reportedly have the world's first fully functional hyperloop train, 2019)

Mumbai - Delhi HL Project

DGW Hyperloop, an inside project by Dinclix Groundworks, stands for a Hyperloop route connecting Mumbai and Delhi through Indore, Kota, and Jaipur. (Hyperloop Technology, 2022)

Punjab HL Project

After Maharashtra, Punjab is the second state in India to construct a hyperloop network.

The state government and Virgin Hyperloop One, located in Los Angeles, inked a Memorandum of Understanding (MoU) to work together on a pre-feasibility economic assessment

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 10 Oct. 2022, pp: 770-783 www.ijaem.net ISSN: 2395-5252

for a hyperloop on the Amritsar- Ludhiana-Chandigarh route.

To investigate a game-changing hyperloop infrastructure project in the area, Virgin Hyperloop is collaborating with the Punjab Government. A hyperloop system could connect several of Punjab's biggest cities in a matter of minutes, beginning with Amritsar, Ludhiana, and Chandigarh, and launching a wider network throughout northern India. By up to 90%, the hyperloop would cut down on travel time between cities.

The Punjab government is analysing whether it is feasible to connect the state's major cities using the hyperloop, a cutting-edge transportation system in which passenger pods travel quickly through vacuum tubes. According to preliminary estimates by Virgin Hyperloop One, a hyperloop transit system along the Amritsar-Ludhiana-Chandigarh corridor may cut the time needed to go from 5 hours by road to under 30 minutes. An agreement for the Rs 56,000 crore project is set to be signed with Virgin Hyperloop.

Origin City	Destination City	Distance (in Km)	Virgin Hyperloop	Airplane	Train	Car
Amritsar	Chandigarh	226	19 min	4 hr 30 min *	4 hr 35 min	3 hr 54 min
Amritsar	Ludhiana	141	13 min	4 hr 10min *	2 hr 5min	2 hr 21 min
Ludhiana	Chandigarh	107	11 min	4 hr 10min *	2 hr 30min	1hr 58min

Source: Virgin Hyperloop, Virgin Hyperloop | Punjab

Airplanes operating in between those cities are having connecting flights. Due to lay over its takes more time to reach the destination.

Interpretation: According to the data given in the table, the time taken to travel between Amritsar and Chandigarh will take 19 minutes only, taking 4 hours and 18 minutes less when travelling by airplane, 4 hours and 16 minutes less when travelling by train, and 3 hours and 35 minutes less when travelling by road.

Similarly, the time taken to between Amritsar and Ludhiana will be 13 minutes less, taking 3 hours and 57 minutes less when travelling by airplane, 1 hour and 52 minutes less when travelling by train, and 2 hours and 8 minutes less when travelling by road. And the time taken to travel between Amritsar and Ludhiana will be 11 minutes less, taking 3 hours and 59 minutes less when, travelling by airplane, 2 hours and 19 minutes less when travelling by train, and 1 hour and 47 minutes less when travelling by road.

Bengaluru's Kempegowda International Airport (BIAL) Hyperloop Project

An agreement that might bring the ultra-fast transportation technology to one of India's busiest airports was signed by Virgin Hyperloop, which is supported by the UAE. A feasibility study will be conducted to investigate an Hyperloop connection that would apparently take 10 minutes to travel from Bengaluru's Kempegowda International Airport (BIAL) to the city Centre.

The current 45 minutes it takes by road to travel from the airport to India's IT hub will be significantly shortened by the Hyperloop system, which is anticipated to transport passengers at speeds of more than 1,000 kmph. In this way Hyperloop can become a part of the solution to tackle congestion and support economic growth in Bengaluru. Depending on the time of day and the amount of traffic in the area, it currently takes 1 to 2 hours to travel the 35 to 40 kilometres between the two locations. (R. Kappan, Sep,2020)

IV. METHODOLOGY

This is a self-driven study grounded in secondary data. Both qualitative and quantitative evaluations frequently made use of the immediately accessible data. When evaluating the available materials and conducting a thorough investigation into the subject, various unique degrees of accuracy were taken into account. This analysis paper is based on the exploratory investigation-connected methods that rely on the data from and sourced from the various research papers, journals, magazines, topic-relevant articles, reports through media, etc. for the study of the understanding and analysis cost and price of the Hyperloop transportation system in Indian Cities.

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 10 Oct. 2022, pp: 770-783 www.ijaem.net ISSN: 2395-5252

V. OBJECTIVES OF THE STUDY

1. To understand hyperloop and its implementation globally and in India.
2. To determine if the hyperloop is implemented from Chennai to Bangalore, what will be the estimate cost and time duration.
3. To evaluate if Hyperloop can be the right alternative means of transportation.
4. To figure out break even period & cost of proposed Chennai – Bangalore Hyperloop project.

VI. ANALYSISAND INTERPRETATION:

Analysis of the cost of implementing hyper loop from Chennai to Bangalore.

According to Elon musk's white paper (Hyperloop Alpha) estimations implementing hyper loop from San Francisco to Los Angeles will take 10 billion dollars.

Cost of implementing hyperloop from Chennai to Bangalore.

Location	USD	INR(18/09/2022)	KM	COST/KM(IN INR)
San Francisco to Los Angeles	10 BILLION	79,650,500,000.00	546	145,880,036.63
Chennai to Bangalore	5.7 BILLION	42,159,330,586.08	289	145,880,036.63

Source: Dudnikov, E.E. (2017).

Distance was calculated by using google map.

Analysis: Cost of Implementation of Hyperloop between San Francisco to Los Angeles is $10 Billion for 546 Km, so cost of implementation of per Kilometre will be $1.7 million. Accordingly Cost of Implementation of Hyperloop between Chennai to Bangalore is $5.7 Billion for 289 Km, since cost of implementation of per Kilometre will be $1.7 million.

Break Even period analysis:

To find the estimated breakeven point we compare the price of other mode of transportation another mode fixes the price according to it.

Table no 1: Cost of travelling from Chennai to Bangalore in different mode of transportation:

CHENNAI TO BANGALORE				
Parameter	ROAD	RAIL	AIR	HL
DISTANCE	348	361	290	290
COST	460	235	3500	?
TIME	381	360	70	30

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 10 Oct. 2022, pp: 770-783 www.ijaem.net ISSN: 2395-5252

Table no: 2 Cost of transporting of goods from Chennai to Bangalore in different mode of transportation.

CHENNAI TO BANGALORE				
PARAMETER	ROAD	RAIL	AIR	HL
DISTANCE	348	361	290	290
COST	45100	1187	36680	?
TIME	400	360	70	30

Table no:3 Operating and ideal time of hyperloop from Chennai to Bangalore.

DETAILS	IN MINUTES	IN HOURS
PER DAY OPERATING TIME	180	3
GAP B/W EACH TRIP	210	3.5
TOTAL IDEAL TIME	1260	21

Calculation Breakeven analysis for 10 years' duration

To find the estimated breakeven point we compare the price of other mode of transportation and so we fix the price according to it.

Cost of travelling from Chennai to Bangalore in different mode of transportation

Table no:4 Calculation Breakeven analyses for 10 years' duration

Implementing cost of hyper loop from Chennai to Bangalore.			42,159,330,586.08		
Cost/trip	15,000		Cost for 500kg cargo	75,000	
Trip/day	6	90000	Trip/day	6	450000
For 28 passengers	2,520,000		Cost for 10 tons of cargo	9,000,000	
1year	919,800,000		1year	3,285,000,000	
10 years	9,198,000,000		10 year	32,850,000,000	
15 years	13,797,000,000		15 year	49,275,000,000	
20 years	18,396,000,000		20 year	65,700,000,000	
25years	22,995,000,000		25years	82,125,000,000	
30 years	27,594,000,000		30 years	98,550,000,000	

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 10 Oct. 2022, pp: 770-783 www.ijaem.net ISSN: 2395-5252

Table no: 5 Then total revenue by both passenger and cargo will be.

BEP in years	RS.	Result	
10	42,048,000,000	42,468,480,000	BEP will be 10 years and 1 month
15	63,072,000,000		
20	84,096,000,000		
25	105,120,000,000		
30	126,144,000,000		

So according to analysis 2 the, breakeven period will be twenty years and one month.
Ticket of a passenger to travel from Chennai to Bangalore will be Rs.15, 000/-
Cost for transporting a cargo from Chennai to Bangalore will be Rs.45, 00, 000/-
The external cost is not considering in this analysis.

Calculation Breakeven analysis for 15 years' duration:
We estimated breakeven will be 15 years so we fix the price of passenger ticket as Rs.10, 000/- and charges for transporting 500-kilogram goods at Rs.50, 000/-. So, the cost for 10 tons' cargo will be thirty lakhs.

Table no:6 Calculation Breakeven analysis for 15 years' duration:

Implementing cost of hyper loop from Chennai to Bangalore			**Rs.42,159,330,586.08**		
Cost/trip	10,000		**Cost for 500kg cargo**	50,000	
Trip/day	6 trips	60000	**Trip/day**	6 trips	300000
For 28 passengers	1,680,000		**Cost for 10 tons cargo**	6,000,000	
1 year	613,200,000		**1 year**	2,190,000,000	
10 years	6,132,000,000		**10 years**	21,900,000,000	
15 years	9,198,000,000		**15 years**	32,850,000,000	
20 years	12,264,000,000		**20 years**	43,800,000,000	
25years	15,330,000,000		**25years**	54,750,000,000	
30 years	18,396,000,000		**30 years**	65,700,000,000	

Table no:7 Then total revenues from both passenger and cargo will be.

BEP in years	RS.	Result
10	28,032,000,000	BEP will be 15 years and 1 month
15	42,048,000,000	42,160,128,000.00
20	56,064,000,000	
25	70,080,000,000	
30	84,096,000,000	

So according to analysis 1 the breakeven period will be fifteen years and one month.
Ticket of a passenger to travel from Chennai to Bangalore will be Rs.10, 000/-
Cost for transporting a cargo from Chennai to Bangalore will be Rs.30, 00, 000/-
The external cost is not considering in this analysis.

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 10 Oct. 2022, pp: 770-783 www.ijaem.net ISSN: 2395-5252

The lifetime of the hyperloop capsule will be 30 years as and the same line can be used for more years with some maintenance.

Calculation Breakeven analysis for 20 years' duration:

We estimated breakeven point need to be in 20 years so we fix the price of passenger ticket as Rs.7, 500/- and charges for transporting 500-kilogram goods at Rs.37, 500/-. So, the cost for 10 tons cargo will be twenty-two lakhs fifty thousand.

Table no:8 Calculation Breakeven analysis for 20 years' duration

Implementing cost of hyper loop from Chennai to Bangalore			42,159,330,586.08		
Cost/trip	7,500		Cost for 500kg cargo	37,500	
Trip/day	6	45000	Trip/day	6	225000
For 28 passengers	1,260,000		Cost for 10 tons cargo	4,500,000	
1year	459,900,000		1 year	1,642,500,000	
10 years	4,599,000,000		10 years	16,425,000,000	
15 years	6,898,500,000		15 years	24,637,500,000	
20 years	9,198,000,000		20 years	32,850,000,000	
25years	11,497,500,000		25years	41,062,500,000	
30 years	13,797,000,000		30 years	49,275,000,000	

Table no :9 Then total revenue by both passenger and cargo will be.

BEP in years	RS.	Result
10	21,024,000,000	
15	31,536,000,000	BEP will be 20 years and 1 month
20	42,048,000,000	42,174,144,000
25	52,560,000,000	
30	63,072,000,000	

So according to analysis 2 the breakeven period will be twenty years and one month.
Ticket of a passenger to travel from Chennai to Bangalore will be Rs.7, 500/-
Cost for transporting a cargo from Chennai to Bangalore will be Rs.22, 50, 000/-
The external cost is not considering in this analysis.

VII. HYPERLOOP: AS AN ALTERNATIVE MEANS OF TRANSPORTATION

The technology will next hopefully be scaled to various city-pairs throughout India. According to estimates, five feasible routes between various Indian cities would take 55 minutes to travel by car between Delhi, Jaipur, and Mumbai, 50 minutes to travel between Mumbai, Bangalore, and Chennai, 41 minutes to travel between Bangalore and Thiruvananthapuram, and 20 minutes to travel between Bangalore and Chennai via the Hyperloop.

On February 6, 2020, the Ministry of Transport for the Kingdom of Saudi Arabia announced that it has achieved an agreement with

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 10 Oct. 2022, pp: 770-783 www.ijaem.net ISSN: 2395-5252

Virgin Hyperloop One (VHO) to conduct a ground-breaking pre-feasibility study on the application of Hyperloop technology for the transportation of people and commodities. In June 2020, Mohamed bin Zayed University of Artificial Intelligence and Virgin Hyperloop also decided to work together to develop Hyperloop technology. Airports are important transportation hubs for more than just passengers, especially for time-sensitive supplies. An airport with Hyperloop access will greatly enhance freight delivery and provide an incredibly effective supply chain. (Virgin Hyperloop, Bangalore Airport Sign Agreement to Explore High-speed Travel, 2020)

Virgin Hyperloop One, the first company in the world to successfully test Hyperloop technology on a broad scale, has unveiled the first brand-new mass transit system in more than a century. The company successfully operated a full-scale Hyperloop vehicle using electric propulsion and electromagnetic levitation in a near-vacuum environment, developing a fundamentally new mode of transportation that is quicker, safer, less expensive, and more environmentally friendly than existing modes. Once operational, the new means of transportation is anticipated to be quicker, safer, less expensive, and more environmentally friendly than current forms.

The Hyperloop is designed to transport both people and goods. As a result, delivery times will be shortened, packages won't break, and fewer delivery vehicles will be used, lowering emissions.

VIII. APPLICATION OF HYPERLOOP

The Hyperloop in Supply Chains

Increasing goods delivery speeds is the invention's most evident benefit to the sector. Global warming also has an effect on supply chains. As the emphasis on sustainability grows, companies are re-evaluating their supply networks. The Hyperloop, according to Port Technology, can travel at above 550 mph. With this, a trip that currently takes three hours may possibly only take ten. (H. Sunol, 2016)

Due to the capsule's rapid movement, more departures will occur increasingly often over time, eventually resulting in on-demand transport with cargo departing as frequently as every two minutes. Due to its operation in a tube, a secure, dedicated environment, it can carry a typical 40-foot intermodal container and has built-in cargo security.

In addition, the hyperloop has a significant impact on sustainable supply chains. In addition to reducing traffic on congested highways where trucks contribute significantly to air pollution, it is a carbon-free means of transportation. due to the low energy use, while also greatly lowering transportation expenses.

This capsule revolutionises not only interior freight transportation but also ocean and air freight transit. It can move cargo below, above ground, and even underwater. Because of its speed and flexibility, distribution and the way organisations manage stocks will change. It will be important to redesign supply chains and logistics processes.

Hyperloop in Medical Management in India.

How can the Hyperloop assist with emergency medical transport in India?

Over the past 20 years, there has been an increase in the usage of air medical transportation. Every day, several patients who require advanced medical care are flown to higher centres around the world. Additionally, there are no suitable medical services within reasonable distance. These are interhospital transfers for patients who are in need of air transportation.

The annual budgetary cost of ground network was estimated at $3,804,000 and helicopter ambulance cost was estimated at $ 16,865,000. Per patient cost worked out to be $4,475 and $2,811, respectively.

The evacuation of organs for medicinal purposes, the transfer of a patient with a catastrophic illness or injury to a different hospital that may be located in a different city or state in India, are just a few examples of the critical roles that the Hyperloop can play in medical emergencies. The Hyperloop will go faster than a helicopter ambulance, improving survival rates while also being less expensive.

According to data by National Institute of Emergency Medicine (NIEM), **more than 20 percent of patients who needed immediate medical care lost their lives due to traffic delays from rural sectors**. A WHO report also revealed that a trip by state-run ambulance services in New Delhi can cost about **Rs. 2,947.50, yet one out of three ambulances did not have paramedical staff on board. (Ganguly, 2020)**

India's medical transportation services have developed rapidly in recent years. However, a number of lives continue to be lost because timely access to good medical care is hampered by high expenses, lack of accessibility, and lack of knowledge. In order to address this, innovation in the healthcare sector is assisting in the introduction of a number of additional methods of urgent medical assistance. This is further evidenced by the recently introduced emergency water transport

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 10 Oct. 2022, pp: 770-783 www.ijaem.net ISSN: 2395-5252

services in Kerala, which signal exponential growth and development in the EMS industry. (M. N. Shah, March, 2006).
These could be considered the best patient transport ambulance available due to their affordability, quick response time, and advanced facilities designed to help save lives even in a highly critical situation.

Hyperloop in Tourism industry

Travelers, according to research, desire both ease and environmental protection. In the Q1 2021 consumer survey conducted by GlobalData, 76% of participants claimed that their purchasing decisions were "always," "often," or "sometimes" impacted by a product's environmental friendliness. In addition, 61% of respondents to GlobalData's 2019 tourism consumer study said they look for vacation items that save time. It is hardly practical, though, given the state of the travel sector at the moment. Although far cleaner than air travel, rail travel is much slower. Even while flying is significantly faster, it has a terrible effect on the environment. Future developments in hyperloop transportation, which could provide a quicker and cleaner alternative, pose a threat to shatter that barrier. (GlobalData, 2021)

Commercialisation highlights the potential of Hyperloop technology

Hyperloop travel presents a workable long-term answer at a time when many organisations and governments are under pressure to explore for more sustainable methods to travel and reduce emissions. Additionally, the current transportation strategy for the tourism industry is unsustainable, necessitating the urgent need for cleaner and more effective modes of transportation. Traditional passenger transportation methods like air and rail are having difficulty keeping up with increasing demand. The owners of these businesses must therefore consider Hyperloop to be a genuine disruptor in the future.

IX. SIGNIFICANCE AND CHALLENGES

Speed:The hyperloop can go up to 1000 km/h, which is two to three times quicker than the bullet train and even commercial aeroplanes, because to the sealed atmosphere that creates little to no friction.
Environment friendly: Using solar power to generate electricity and the silent maglev system, it has a smaller environmental impact than trains and no direct emissions.
Economical: The Hyperloop requires less space to go through and produces its own electricity from solar panels. The capital cost per mile for hyperloop is 60% less than that of high-speed rail, and operating costs are also lower. As a result, the cost may be considerably less than that of an aeroplane or a bullet train.
Frequent departures: Unlike trains, the hyperloop might have a departure every 20 seconds, which is a low frequency.
Less prone to Human Error: Human error is less likely because the system is completely automated and sealed.
Less Land Requirement: Less land is needed since steel tubes can be tunnelled under the earth or placed on a column.
Energy Source: Any type of energy source, including solar cells, wind turbines, and even nuclear reactors, can be used by the hyperloop.
Resistant to Earthquake: Be Hyperloop would be supported by columns with two lateral dampers that could be adjusted, the tube would not be rigidly anchored to the ground, making it earthquake resistant. This would enable it to absorb the movement's force rather than being broken by it.
Immune to adverse weather
(Hyperloop – the Future of Transportation 09/10/2018, 2018)

The challenges in implementing Hyperloop

- **Investment**: It requires significant investment, thus effective cooperation between the public and private sectors is needed to put it into action.
- **Technical difficulties:**
- Due to vibration and jostling as well as being subject to extreme gravitational forces during manoeuvres, travelling at the speed of sound may make passengers feel queasy. The Hyperloop must move in a straight line to prevent this. When it does turn, those turns must be very mild. It shouldn't actually be turning at all.
- A power loss has the potential to seriously impair the hyperloop.
- The production of long vacuum chambers requires considerable technical expertise.
- The track for the hyperloop is made of steel, therefore it expands and changes shape when the outside temperature changes. The hyperloop technological track could be destroyed by this. When constructing the systems based on the local environment, this must be taken into account.
- **Land use rights**: will also be a problem when the project is put into action.

- **Accidents:** When an automated system malfunctions, there is an extremely high danger of death.
- **Environmental damage**: The construction of infrastructure necessitates the removal of many trees. There will be environmental harm as a result.

(Hyperloop – the Future of Transportation 09/10/2018, 2018)

X. FINDING & CONCLUSION

Finding

1. Cost of Implementation of Hyperloop between San Francisco to Los Angeles is $10 Billion for 546 Km as mentioned by Elon Musk, so cost of implementation of per Kilometre will be $1.7 million. Accordingly Cost of Implementation of Hyperloop between Chennai to Bangalore is $5.7 Billion for 289 Km, since cost of implementation of per Kilometre will be $1.7 million.
2. As per over analysis we calculated the three different breakeven period (10,15,20 years). Among of those three analyses, we suggesting 15 years break-even will be best, because the price is little affordable and we will get the implementing cost in 15 years. Ticket of a passenger to travel from Chennai to Bangalore will be Rs.10, 000/- Cost for transporting a cargo from Chennai to Bangalore will be Rs.30, 00, 000/- The external cost is not considering in this analysis. The lifetime of the hyperloop capsule will be 30 years as and the same line can be used for more years with some maintenance. So, ticket price per passenger is 10,000 and for 10-ton cargo 60 lakhs. The time is reduced half compare existing fastest mode of transport (Airways) and ticket price is twice then it.

Conclusion

Indian cities have made it their specialty to use technology to improve their transportation systems. This is not surprising when one looks at the data in certain important areas, such as atmosphere, political economy, and safety. For instance, according to information from the World Health Organization (WHO), 17 cities in India are among the top cities worldwide with the highest levels of PM10. And according to a study by IIT Madras, congestion on city roads costs over $10 billion yearly, or about Rs. 60,000 crores, as a result of fuel wastage from the use of vehicles, which would ultimately increase pollution levels in the environment.

Hyperloop can be the good alternative means of transportation and could have the significant in the supply chain sector of India and medical management system of India. The Hyperloop, according to Port Technology, can travel at above 550 mph. With this, a trip that currently takes three hours may possibly only take ten. Hyperloop could be considered the best patient transport ambulance available due to their affordability, quick response time, and advanced facilities designed to help save lives even in a highly critical situation.

REFERENCE

[1]. Catherine L. Taylor, David J. Hyde, Lawrence C. Barr (2016), Hyperloop Commercial Feasibility Analysis: High Level Overview, United states Department of Transportation, Published Date: 2016-07-01, DOT-VNTSC-NASA-16-01, URL: https://rosap.ntl.bts.gov/view/dot/12308

[2]. Jonas Kristiansen Nøland (2021), "Prospects and Challenges of the Hyperloop Transportation System: A Systematic Technology Review," in IEEE Access, vol. 9, pp. 28439-28458, 2021, doi: 10.1109/ACCESS.2021.3057788.URL: https://www.semanticscholar.org/paper/Prospects-and-Challenges-of-the-Hyperloop-System%3A-A-N%C3%B8land/1365cc602523927d1af901ee609406f3318e9bbf

[3]. Dudnikov, E.E. (2017). Advantages of a new Hyperloop transport technology. 2017 Tenth International Conference Management of Large-Scale System Development (MLSD), 1-4.

[4]. URL:https://www.semanticscholar.org/paper/Advantages-of-a-new-Hyperloop-transport-technology-Dudnikov/82faf0a62faabf3c225e7dc5c3a3bee3993816c5

[5]. Rajshri Tukaram Shinde1, Vaishnavi Balasaheb Raijade2, Abhishek Sunil Lahare3, Vijay B. Sarode4 (2017), Hyperloop Transportation System, International Research Journal of Engineering and Technology (IRJET), Volume: 04 Issue: 04 | Apr -2017, e-ISSN: 2395 -0056, p-ISSN: 2395-0072, Page nos. 763-766, Impact Factor value: 5.181 | ISO 9001:2008 Certified URL: Journal. https://www.academia.edu/33453922/Hyperloop_Transportation_System

[6]. Parsoya, Shubham. (2022). Study of the Role and Importance of Futuristic & Fast Transportation Technology in Shaping the

Bright Future of India. DOI: 10.13140/RG.2.2.25197.87520.

[7]. URL: (PDF) Study of the Role and Importance of Futuristic & Fast Transportation Technology in Shaping the Bright Future of India (researchgate.net) URL: https://www.tesla.com/sites/default/files/blog_images/hyperloop-alpha.pdf Elon Musk,(2013), Hyperloop Alpha

[8]. Gkoumas, K. Hyperloop Academic Research: A Systematic Review and a Taxonomy of Issues. Appl. Sci. 2021, 11, 5951. https:// doi.org/10.3390/app11135951

[9]. Musk, Elon, Hyperloop Alpha Document, published by SpaceX, August 2013

[10]. (MOHAN, 2019)

[11]. Hyperloop One, https://hyperloop-one.com/

[12]. Hyperloop Transportation Technologies, HTT, www.hyperloop.global/

[13]. van Goeverden, K., Milakis, D., Janic, M., &Konings, R. (2017). Performances of the HL (Hyperloop) transport system. In M. Cools ,& S. Limbourg (Eds.), Proceedings of the BIVEC-GIBET Transport Research Days 2017: Towards an Autonomous and Interconnected Transport Future (pp. 29-43). BIVEC-GIBET.

[14]. Hyperloop, V. (n.d.). HyperLoop. virginhyperloop.com. Retrieved November 8, 2020, from https://virginhyperloop.com/ (Hyperloop, n.d.)

[15]. (Etherington, 2017) OR Etherington, D. (2017, September 6). HTT signs agreement to develop a Hyperloop in India. TechCrunch+.

[16]. Kappan, R. (2020, September). Virgin hyperloop BIAL sign MoU to study feasibility of high speed corridor. Deccanherald. https://www.deccanherald.com/city/top-bengaluru-stories/virgin-hyperloop-bial-sign-mou-to-study-feasibility-of-high-speed-corridor-893676.html

[17]. Graat, M. (n.d.). The Impact of the Hyperloop on Supply Chains. Logisticsmatter. Retrieved October 8, 2022, from https://logisticsmatter.com/the-impact-of-the-hyperloop-on-supply-chains/ OR (Graat, n.d.)

[18]. : Ingo A. Hansen (2020) Hyperloop transport technology assessment and system analysis, Transportation Planning and Technology, 43:8, 803-820, DOI: 10.1080/03081060.2020.1828935

[19]. Doppelbauer, Dr. J. (n.d.). Hyperloop – an Innovation for Global Transportation? European Agency for Railways. Retrieved October 8, 2022, from https://www.era.europa.eu/content/hyperloop-innovation-global-transportation_en

[20]. INDIAN RAILWAYS PASSENGER RESERVATION ENQUIRY. (n.d.). Indian Railway. Retrieved October 9, 2022, from https:// www.indianrail.gov.in/ enquiry/StaticPages/ StaticEnquiry.jsp? StaticPage=index.html

[21]. Delivery Service Fees. (n.d.). Shipkar. Retrieved October 9, 2022, from http://ship.shipkar.com/

[22]. Ghoshal, A. (2017, November 24). Can Hyperloop Really Be A Panacea For India's Transport Woes?Vccircle. https://www.vccircle.com/can-hyperloop-really-be-a-panacea-for-indias-transport-woes

[23]. Chauvet, Z. (2021, February 9). Hyperloop: a sustainable solution for the future of freight. Geneva Solutions. Retrieved October 11, 2022, from https://genevasolutions.news/science-tech/hyperloop-a-sustainable-solution-for-the-future-of-freight

[24]. Hyperloop – The Future of Transportation 09/10/2018. (2018, October 9). IAS Express. Retrieved October 12, 2022, from https://www.iasexpress.net/hyperloop/

[25]. Hyperloop Technology. (2022, October). Geeksforgeeks. https://www.geeksforgeeks.org/hyperloop-technology/

[26]. INDIA WILL REPORTEDLY HAVE THE WORLD'S FIRST FULLY FUNCTIONAL HYPERLOOP TRAIN. (2019, August 1). Tech2. https://www.firstpost.com/tech/news-analysis/india-will-reportedly-have-the-worlds-first-fully-functional-hyperloop-train-7092631.html

[27]. Mohan, V. (2019, November 19). After Maharashtra, Punjab set to seal Hyperloop deal. Times of India. Retrieved October 12, 2022, from https://timesofindia.indiatimes.com/city/chandigarh/after-maharashtra-punjab-set-to-seal-hyperloop-deal/articleshow/72122069.cms

[28]. Ganguly, S. (2020, November 12). How New Delhi-based Medulance is disrupting the medical transportation segment in India. Your Story. Retrieved October 12, 2022, from https://yourstory.com/2020/10/delhi-startup-medulance-disrupting-medical-transportation-segment/amp

[29]. DIFFERENT MODES OF MEDICAL TRANSPORT IN INDIA. (2013, June 3). ZIQITZA Healthcare Limited. Retrieved October 12, 2022, from https://www.zhl.org.in/blog/different-modes-of-medical-transport-in-india/

[30]. Shah M. N. (2006). The formation of the emergency medical services system. American journal of public health, 96(3), 414–423. https://doi.org/10.2105/AJPH.2004.048793

[31]. Sunol, H. (2016, July 6). Innovative Logistics Technology & Trends: The Hyperloop. CYZERG Warehouse Technology. https://articles.cyzerg.com/innovative-logistics-technology-trends-the-hyperloop

[32]. GlobalData. (2021, July 20). Hyperloop travel will become a future disruptor in tourism. Railway Tehnology. Retrieved October 12, 2022, from https://www.railway-technology.com/comment/hyperloop-future-disruptor-tourism/

[33]. Virgin Hyperloop, Bangalore airport sign agreement to explore high-speed travel. (2020, September 28). ARAB NEWS. Retrieved October 12, 2022, from https://www.arabnews.com/node/1740931/%7B%7B