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e-mail : sch.tpi@gmail.com

Knowledge

Department of Science and Humanities
Technique Polytechnic Institute
Panchrokhi, Sugandhya, Hooghly, West Bengal, PIN - 712102

EDITORIAL

We are glad for the timely publication of *'Know-Edge',* Technical magazine of the Department of Science and Humanities. The faculty members are interested in innovative topics gaining momentum in recent era. This magazine will give us a vivid view of these subject matters.

We sincerely thank our Chairman (Governing Body), Executive Director, Principal and Coordinator for their valuable advice that motivates us for this publication.

We convey our heartiest thanks to our colleagues for their cooperation and contribution without which successful publication would remain incomplete. We wish for the best achievements of this magazine in coming days.

CONTENTS

DIVINE KANYA-KUMARI

Preetha Banerjee, Lecturer
Dept. of Science and Humanities

Kanya-kumari is a name we are well accustomed from our childhood, for its geographical importance. Previously it was known as Cape Comorin. It is in the extreme south of our country, surrounded on three sides by the Lakshadweep Sea. It is named Kanya – kumari from the Devi Kanya Kumari Temple in the region. According to legend, Goddess Parashakti is one of her incarnations as Devi Kanya, did penance here to secure Shiva's hand in marriage. As she could not achieve her ambition , she vowed to remain virgin ever after. It is a notable place for pilgrimage and tourism. The Vivekananda rock Memorial marks an important part to a visit in this place. One can avail ferry services from Kanyakumari to reach Vivekananda rock.

History says Swami Vivekananda visited Kanya-kumari on December 24, 1892 prior to his Chicago trip to participate in the World Religious Conference. It is said that for two days he meditated on a rock and attained enlightment. Native people of the place say that the rock is sacred as Devi Kumari touched the rock while performing austerity. In January 1962, to celebrate the birth centenary of Swamiji 'the Kanyakumari committee' comprising of a group of people decided to build a memorial of Swamiji on the rock and also a bridge for people to visit the rock. The committee had to face political turbulence, and finally the project was

approved by the Prime Minister of that time Smt. Indira Gandhi. The memorial was completed within six years involving 650 workers. In 1970 it was inaugurated and dedicated to the nation. The architectural style of the memorial follows a blend of Tamil Nadu and West Bengal. It houses a bronze statue of Swami Vivekananda in his famous 'Parivarjak' posture was made by famed sculptor Sitaram S Arte. The memorial symbolizes purity and unity preached by Swamiji has for years been considered as the most revered memorial of India. The Rock Memorial offers a crystal clear view of the confluence of the Indian Ocean, the Bay of Bengal and the Arabian Sea.

EMPLOYMENT AND UNEMPLOYMENT IN INDIA

Soumi Das, Lecturer

Department of Science & Humanities

ABSTRACT: Employment is a significant feature for economic development. India is the second most populous and seventh major country in the world. Our country has beleaguered with major constant problem of unemployment. The purpose of this article is to study the employment in organized public and private sectors in India. Since independence, unemployment rate has been progressively growing in spite of Five Year plans. The present study examines the Growth of Employment in India. Employment has always featured as an element of development policy in India. The study is based on secondary information. The prevalent idea of many Asian countries is to attain complete, productive and well-mannered employment. Considering the present employment and unemployment scenario in the country, the Eleventh Five Year Plan has devised strategies for rapid growth in employment opportunities along with the quality of employment. The paper focuses on nature and measurement of unemployment.

Keywords : Employment, India, Public and Private Sector, Organized, Unemployment.

1. INTRODUCTION

In India, as population growth is higher, the employment rate also is found to be higher. Since Independence, unemployment rate has been progressively increasing in spite of Five Year Plans. Earlier, rural employment has declined due to the growth of industrialization and service sector. The Eleventh Five Year plan has proved that the service sector is emerging very strong both in employment creation and in its contribution to the National Income. In the process of development of secondary and tertiary sector activities, rural sector is in distress. Extended expression employment growth during 1972-73 to 1983 was 2.44 percent and 1.84 per cent in 1993-94 & 2004-05. Thus when GDP grew at 4.7 per cent per annum during 1972-73 to 1983, employment growth was 2.4 per cent, but employment growth declined to 2.0 per cent during 1983 & 1993-94. During 1993-94 & 2004-05 GDP growth accelerated to 6.3 per cent, but employment growth further declined to 1.8 per cent during the 2004-05 & 2009-10. Unemployment brings, in its wake, a large number of socio-economic problems in many different ways. The negative impact of employment is diverse and acute. In addition to lowering

output and income, it can also lead to rising income inequality, loss of human capital and skill, ill health and mortality, migration, loss of motivation for future works, los of human relations, and social life. Employment development in the secondary sector, consisting of mining, manufacturing, electricity, water and gas, and construction, has been comparatively far exceeding the ground, in fact the maximum among the three sectors.

2. METHODOLOGY

The study has made use of secondary data. The secondary data were drawn from various reports published by Government of India. The main sources of data on employment and unemployment are the various surveys being conducted by the National Sample Survey Organization (NSSO), the population Census.

3. REVIEW OF LITERATURE

R. Hashim (1999) examined that the important feature of the employment situation in India has been that the rates of unemployment are rather low and these low rates have existed along with a high level of poverty. An increasing proportion of non-poor and educated among the open unemployed is also an emerging phenomenon. This has evoked the ongoing debate about visible and invisible under employment leading to low levels of income. This paper examines these aspects in the light of the prevailing trends and discusses the policy implications for growth and structural changes and special measures for generating work for the unemployed.

Bishwanath Gondar (2001) pointed out in his study on the employment in organized manufacturing sector that it remained virtually stagnant in the 1980s; there has been a marked acceleration in the growth employment in the 1990s. Acceleration in employment growth is found both at the aggregate level and for most industries. This may partly be explained by changes in the size structure in favour of small and medium-size factories. Another important explanation for the acceleration in employment growth seems to lie in a slow-down in the growth in real wages.

R. Mohan's (2004) study proposes to examine the association between growth in employment and economic growth. In the course of the study, he also examined the relationship between employment growth and other variables like labour productivity, capital intensity per worker etc, with a view to form hypotheses for further study. The empirical examination reveals that growth rate in employment and economic growth has no statically significant relationship. But growth

during 1980-81 to 1999-2000 cannot be described as jobless growth as growth itself has not been statistically significant during the period. Increase in growth during the 1980s has just been sustained in the 1990s.

Suresh Chand Agarwal (2006) studied the empirical relationship between real wage rates and employment levels in the Indian public enterprises. The study finds that the expected negative relationship between the two did not exist in the fifteen years of the pre-reform era but was found in the post reform period. The wage share has also reduced rapidly over the years indicating a possible weakening of trade unions in the sector.

Sundaram's (2007) study of employment-unemployment situation in the nineties made certain general observations regarding the size and structure of work-force, the extent of unemployment and under-employment, labour productivity and days worked 'in rural and urban India. Key results include a slower growth of work-force relative to that of population; a reduction in the share and size of work-force in agriculture and in community social and personal services and widespread gains in labour productivity.

4. EMPLOYMENT IN ORGANIZED PUBLIC SECTOR & PRIVATE SECTOR IN INDIA Public sector has contributed to a significant extent in overall employment situation in the country and has acted as a model employer by providing the workers with better wages and other facilities as compared to the private sector. At the time of independence, activities of the public sector were restricted to a limited field like irrigation, power, railways, ports, communications and some departmental undertakings. After independence, the area of the activities of the public sector expanded at a very rapid speed. The position of employment in organized sector is shown in table 1.

Table 1: Year-wise Employment in Public and Private Sectors in India (In Lakhs)

Year	Public Sector	Private Sector	Total
2000	193.14	86.49	279.63
	(69.07)	(30.93)	(100.00)
2001	191.39	86.51	277.9
	(68.87)	(31.13)	(100.00)
2002	187.74	84.32	272.06
	(69.01)	(30.99)	(100.00)
2003	185.8	84.17	269.97
	(68.82)	(31.18)	(100.00)
2004	181.97	82.45	264.42

	(68.82)	(31.18)	(100.00)
2005	180.06	84.52	264.58
	(68.06)	(31.94)	(100.00)
2006	181.88	87.71	269.59
	(67.47)	(32.53)	(100.00)
2007	180.02	92.6	272.62
	(66.03)	(33.97)	(100.00)
2008	176.74	98.38	275.12
	(64.24)	(35.76)	(100.00)
2009	177.95	102.91	281.86
	(63.13)	(36.51)	(100.00)
2010	178.62	107.87	287.08
	(62.22)	(37.57)	(100.00)

Source: *Economic Survey 2010-2011, Government of India.*

The table 1 shows that the total employment in organized sector increased to 287.08 lakh persons in 2010 from 279.63 lakh persons in 2000 i.e. an increase of 0.8 times. The percentage share of public sector in total employment declined to 62.22% in 2010 from 69.07% in 2000, whereas the percentage of share as private sector increased to 37.57 % in 2010 from 30.93% in 2000.

5. EMPLOYMENT IN ORGANIZED SECTORS – PUBLIC AND PRIVATE

The trend of changes in various sectors of organized sector both public and private, the sector-wise position of employment is shown in table 2.

Table 2 : Employment In Organized Public Sector (Lakh Persons)

Sector	2005	2006	2007	2008	2009	2010
Agriculture	4.96	4.69	4.75	4.71	4.77	4.78
Mining	10.14	11.46	11.37	11.21	11.12	11.03
Manufacturing	11.30	10.92	10.87	10.44	10.60	10.66
Electricity, Gas and Water	8.60	8.49	8.49	7.96	8.39	8.35
Construction	9.11	8.94	8.66	8.52	8.45	8.59
Trade	1.84	1.82	1.78	1.65	1.74	1.71
Transport	27.51	26.75	26.37	26.34	26.01	25.29
Finance, Insurance, Real Estate	14.08	13.90	13.69	13.47	13.56	14.13
Community, Social and Personal Services	92.52	91.76	90.90	88.54	90.11	90.51
Total	180.07	178.73	176.88	172.84	174.75	175.05

Source: *Ministry of Labour and Employment, Director General of Employment and Training*

The table 2 shows the total employment in organized public sector decelerated from 180.07 lakh persons in 2005 to 175.05 lakh persons in 2010. The organized sector was dominated by the public sector which accounts for 70% of total employment in this sector. This is mainly due to the effect of community, social and personal services, transport, financial services, manufacturing and mining sectors. These collectively constitute a major share in total employment of organized public sector.

Table 3 : Employment in Organized Private Sector

Sector	2005	2006	2007	2008	2009	2010
Agriculture	9.83	10.28	9.50	9.92	8.96	9.23
Mining	0.79	0.95	1.00	1.11	1.15	1.61
Manufacturing	44.89	45.49	47.50	49.70	51.98	51.84
Electricity, Gas and Water	0.49	0.40	0.50	0.51	0.64	0.64
Construction	0.49	0.55	0.70	0.69	0.80	0.91
Trade	3.75	3.87	4.10	2.72	4.72	5.06
Transport	0.85	0.87	1.00	1.04	1.32	1.66
Finance, Insurance, Real estate	5.23	6.52	8.80	10.96	13.11	15.52
Community, Social and Personal Services	18.20	18.78	19.50	21.73	20.23	21.40
Total	84.52	87.71	92.40	98.38	102.91	107.87

Source: *Ministry of Labour and Employment, Director General of Employment and Training, Economic Survey 2010-2011, Survey 2010-2011*

The above table shows that the total employment in organized private sector. The data in the table reveals that the total employment in organized private sector increased from 84.52 lakh persons in 2005 to 107.87 lakh persons by 2010. In this organized private sector, manufacturing sector has a major share in providing employment to the unemployed. i.e. 44.89 lakh persons in 2005 and it increased to 51.84 lakh persons by 2010. Behind the manufacturing sector community, social and personal services and agriculture sectors are the important sectors in providing employment to the people in organized private sector. The above data from the two tables and figures indicate that there is wider gap between the organized public and private sector in providing employment opportunities to the unemployed people in India.

6. GROWTH OF EMPLOYMENT IN INDIA

The total employment of organized sector has increased slightly. Within the organized sector, the public sector employment has declined, whereas private sector employment has increased

to a greater extent. The percentage share of male employment has declined throughout the period, whereas female employment increased in both public and private sectors. On the whole, the structure of employment has undergone various changes in the organized sector of India. The new employment opportunities are likely to be generated in the unorganized sector. It will be characterized by poor condition of worker, lack of employment and social security providing.

Table 4 : Employment Growth

Sector	1993-94 to 2004-05	1999-2000 to 2009-10
Primary sector	0.67	-0.13
Mining and quarrying	-0.08	2.70
Manufacturing	3.17	1.95
Utilities	-1.86	2.11
Construction	7.19	9.72
Secondary sector	3.97	4.64
Trade, Hotelling, etc.	5.24	2.54
Transport and Communication etc.	5.16	3.68
Financing , Insurance Real Estate and business services	7.23	7.68
Community, Social and Personal	0.40	1.85
Services		
Territory sector	3.41	2.83
All Non- Agricultural	3.64	2.61
Total	1.84	1.50

Source: *NSS data on employment and unemployment.*

The growth rates of employments derived from NSS data are given in table 4. From this data we understand that the growth of employment declined from 1.84 percent per annum during the 10 year period 1993-94 to 2004-05 to 1.50 percent per annum during 1999-2000 to 2009-2010. We have grouped the data into primary, secondary and tertiary sectors. In the primary sector, there is deceleration of growth rate of employment from 0.67 percent to -0.13 percent during post liberalization period 1994-2010. In the secondary sector, the effect of financial services resulted in a modest improvement in the growth rate from 3.97 percent during 1993-94 to 2004-05 to 4.64 percent during 1999-2000 to 2009-2010. However, in the tertiary sector there is deceleration in the growth rate of employment from 3.41 percent to 2.83 percent. This data implies that the growth rate in employment is less than the growth rate in labor force and this has resulted in an increase in the unemployment rate.

Nature of Unemployment in India: The unemployment rate in India was last reported at 3.8 percent in 2010/11 fiscal year. Historically, from 1983 until 2011, India Unemployment Rate averaged 7.5700 percent reaching an all-time high of 9.4000 percent in December of 2009 and a record low of 3.8000 percent in December of 2011. The unemployment rate can be defined as the number of people actively looking for a job as a percentage of the labour force. India presently suffers mainly from structural unemployment which exists in open and disguised forms. Unemployment being an economic evil, attracted the concern of the policy makers in the developed as well as the developing world, it is heartening to note that government in

the developing economies exhibited their commitments to alleviate employment problems.

Measurement of Unemployment: Estimates from EUS are available on three different conceptual categories are as shown below figure 1.

Fig. 1: Shows Different Categories of Unemployment

(A) Usual Status (US) Approach: The usual status concept is meant to determine the usual activity status, employed, or unemployed or outside the labour force of those covered by the survey. The usual status unemployment is a person rate and indicates chronic unemployment because all those who are found usually unemployed in the reference year are counted as unemployed.

(B) Current Weekly Status (CWS) Approach: The current weekly status concept determines the activity status of a person with reference to a period of preceding seven days. A person

having worked for an hour or more on any one are more days during the reference period gets the employed status. The current weekly status unemployment rate, like the usual status unemployment rate, is all so a person rate.

(C) Current Daily Status (CDS) Approach: The current daily status concept considers the activity status of person for each day of the preceding seven days. A person who works for one hour but less than four hours is considered having worked for half a day. If he works for four hours or more during a day, he is considered as employed for the whole day. The current daily status unemployment rate is a time rate.

Table 5 : Unemployment Rates (% of Labour Force)

Year	Usual Status	Current Weekly Status	Current Daily Status
1993-1994	2.78	3.67	6.03
1999-2000	2.75	4.35	7.28
2004-2005	3.19	4.49	8.23
2009-2010	2.51	3.61	6.52

Source: *NSS data on unemployment.*

The unemployment rates on current daily status (CDS) basis which includes both open and under employment and those on current weekly status (CWS) and Usual Principle Status (UPS) basis are given in the table 5. During the period1993-94 to 2009-2010, however, unemployment rates, including those based on current daily status, have increased. Looking at different rates of unemployment, it is clear that unemployment is a problem of much larger magnitude than open unemployment. For example, in 2009-2010 usual status unemployment rate was estimated to be only 2.51 per cent as compared to Current Weekly Status (CWS) rate of 3.61 per cent and Current Daily Status (CDS) rate of 6.52 percent. The problem, however, is not confined to these time criterion based rates, a large part of the employed people work at very low levels of income, as indicated by much higher incidence of poverty than of unemployment. Thus the employment challenge in India consists not only of creating jobs for the unemployed and providing additional work to the under employed, but, to a much larger extent, of enhancing productivity income levels of a large of the work in poor.

Types of Unemployment: Having studied the meaning of unemployment, now let us discuss the various types of unemployment. Broadly, unemployment can be divided into two types: voluntary and involuntary.

Voluntary unemployment arises due to reasons that are specific to an individual, while involuntary unemployment is caused by a large number of socio-economic factors such as structure of the market, level and composition of aggregate demand, government intervention.

Unemployment is broadly classified in following categories. This type of unemployment may be caused due to a number of reasons. For example, one may quarrel with the employer and resign or one may have permanent source of unearned income, absentee workers, and strikers. Involuntary unemployment occurs when at a particular time the number of workers is more than the number of jobs. Obviously this state of affairs arises because of the insufficiency or non-availability of work.

6.1 Structural Unemployment

This kind of unemployment occurs when there is any change in consumer demand and technology in the economy. When demand for labour falls short of supply of labour due to rapidly growing population and their immobility, the problem of unemployment appears in the economy. Besides, due to growing population, rate of capital formation falls down which again

limits the employment opportunities, this type of structural unemployment is basically related to this category of unemployment.

6.2 Cyclical Unemployment

When there is an economy-wide decline in aggregate demand for goods and services, employment declines and unemployment correspondingly increases. Cyclical unemployment is caused by the trade or business cycles. Cyclical unemployment results from the profits and loss and fluctuations in the deficiency of effective demand production and there is a general state of depression which causes unemployment periods if cyclical unemployment is longer and it generally affects all industries to a greater or smaller extent**.**

6.3 Frictional Unemployment

This type of unemployment refers to a transition period of looking for a new job, for different reasons, such as seeking a better job, being fired from a current job, or having voluntarily quit a current job. The unemployment generated due to the change in market conditions is called frictional unemployment. Agriculture is the main occupation in India. The supply condition still depends on weather and similarly demand conditions depend on availability of resources. Any change arising either of any or both creates a diversion from the equilibrium which results in frictional unemployment.

6.4 Seasonal Unemployment

A type of frictional unemployment occurs in specific activities or occupations which are characterized by seasonal work. An example of seasonal unemployment is the joblessness during non-cultivation in rural areas. Seasonal unemployment occurs at certain seasons of the year. It is a widespread phenomenon of Indian villages basically associated with agriculture. Since agricultural work depends upon Nature, therefore, in a certain period of the year there is heavy work, while in the rest, the work is lean. For example, in the sowing and harvesting period, the agriculturists may to engage themselves day and night.

6.5 Natural Rate of Unemployment

The sum total of frictional and structural unemployment is referred to as the natural rate of unemployment.

6.6 Open Unemployment

Open unemployment is to be distinguished from disguised unemployment and underemployment in that while in the case of former unemployment workers are totally idle, but in the latter two

types of unemployment they appear to be working and do not seem to be away their time. When the labourers live without any work and they don't find any work to do, they come under the category of open unemployment. Educated unemployment and unskilled labour unemployment are included in the open unemployment.

7. CONCLUSION

Employment is an important aspect for economic development. India is a conventional varied developing economy with important private sector contribution to it. The development process has brought about insignificant changes in the arrangement of the India's economy. The first important variance from the previous period relates to collective employment growth itself. Predominantly prominent is that still falling real wages in a framework of comparatively strong development in organized sector and rising labour productivity have not been sufficient to ensure growth in employment. Rising unemployment and underemployment are two crucial problems that many developing economies countenance. The problem of unemployment has serious socioeconomic implications. While at the individual level, unemployment leads to malnutrition, illness, mental stress, depression, and deterioration of human values; at the level of the economy it implies underutilization of existing human capital.

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BRIEF CONCEPT OF WORM HOLE

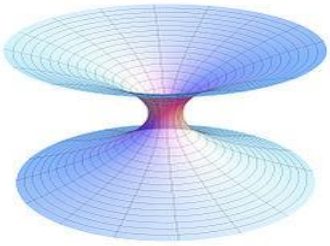
Jeet Dutta, Lecturer
Dept. of Science and Humanities

Abstract:- Like black holes, wormholes arise as valid solutions to the equations of Albert Einstein's General Theory of Relativity, and, like black holes, the phrase was coined (in 1957) by the American physicist John Wheeler. Also like black holes, they have never been observed directly, but they crop up so readily in theory that some physicists are encouraged to think that real counterparts may eventually be found or fabricated. The main aim of this paper is to give an idea about wormholes.

Introduction:- Wormholes are solutions to the Einstein field equations for gravity that act as "tunnels," connecting points in space-time in such a way that the trip between the points through the wormhole could take much less time than the trip through normal space.

The first wormhole-like solutions were found by studying the mathematical solution for black holes. There it was found that the solution lent itself to an extension whose geometric interpretation was that of two copies of the black hole geometry connected by a "throat" (known as an Einstein-Rosen bridge). The throat is a dynamical object attached to the two holes that pinches off extremely quickly into a narrow link between them.

Theorists have since found other wormhole solutions; these solutions connect various types of geometry on either mouth of the wormhole. One amazing aspect of wormholes is that because they can behave as "shortcuts" in space-time, they must allow for backwards time travel! This property goes back to the usual statement that if one could travel faster than light, that would imply that we could communicate with the past.
Needless to say, this possibility is a disturbing one; time travel would allow for a variety of paradoxical situations, such as going back into the past and killing your grandfather before your father was born (the grandfather paradox). The question now arises of whether it would be possible to actually construct a wormhole and move it around in such a way that it would become a usable time machine.
Wormhole geometries are inherently unstable. The only material that can be used to stabilize them against pinching off is material having negative energy density, at least in some reference frame. No classical matter can do this, but it is possible that quantum fluctuations in various fields might be able to.
Stephen Hawking conjectured that while wormholes might be created, they cannot be used for time travel; even with exotic matter stabilizing the wormhole against its own instabilities, he argued, inserting a particle into it will destabilize it quickly enough to prevent its use. This is known as the Chronology Protection Conjecture.
Wormholes are great theoretical fun, and are seemingly valid solutions of the Einstein equations. There is, however, no experimental evidence for them.



Brief History:- In 1916, the Austrian physicist Ludwig Flamm, while looking over Karl Schwarzschild's solution to Einstein's field equations, which describes a particular form of black hole known as a Schwarzschild black hole, noticed that another solution was also possible, which described a phenomenon which later came to be known as a “white hole”. A white hole is the theoretical time reversal of a black hole and, while a black hole acts as a vacuum, drawing in any matter that crosses the event horizon, a white hole acts as a source that ejects matter from its event horizon. Some have even speculated that there is a white hole on the "other side" of all black holes, where all the matter the black hole sucks up is blown out in some

alternative universe, and even that what we think of as the Big Bang might in fact have been the result of just such a phenomenon.
Flamm also noticed that the two solutions, describing two different regions of space-time could be mathematically connected by a kind of space-time conduit, and that, in theory at least, the black hole "entrance" and white hole "exit" could be in totally different parts of the same universe or even in different universes! Einstein himself explored these ideas further in 1935, along with Nathan Rosen, and the two achieved a solution known as an Einstein-Rosen bridge (also known as a Lorentzian wormhole or a Schwarzschild wormhole).

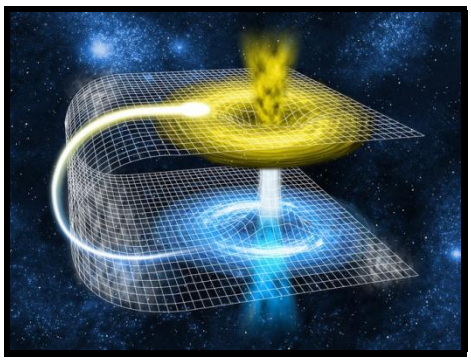
Schwarzschild wormholes:- Lorentzian wormholes known as Schwarzschild wormholes or Einstein-Rosen bridges are bridges between areas of space that can be modeled as vacuum solutions to the Einstein field equations by combining models of a black hole and a white hole. This solution was discovered by Albert Einstein and his colleague Nathan Rosen, who first published the result in 1935. However, in 1962 John A. Wheeler and Robert W. Fuller published a paper showing that this type of wormhole is unstable, and that it will pinch off instantly as soon as it forms, preventing even light from making it through.

Before the stability problems of Schwarzschild wormholes were apparent, it was proposed that quasars were white holes forming the ends of wormholes of this type.

While Schwarzschild wormholes are not traversable, their existence inspired Kip Thorne to imagine traversable wormholes created by holding the 'throat' of a Schwarzschild wormhole open with exotic matter (material that has negative mass/energy).

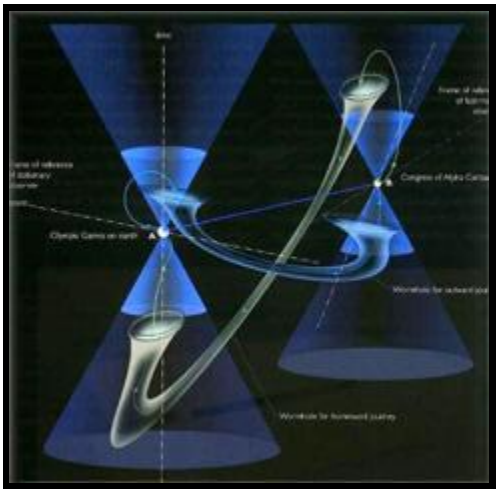
Traversable wormholes:- Lorentzian traversable wormholes would allow travel from one part of the universe to another part of that same universe very quickly or would allow travel from one universe to another. The possibility of traversable wormholes in general relativity was first demonstrated by Kip Thorne and his graduate student Mike Morris in a 1988 paper; for this reason, the type of traversable wormhole they proposed, held open by a spherical shell of exotic matter, is referred to as a Morris-Thorne wormhole. Later, other types of traversable wormholes were discovered as allowable solutions to the equations of general relativity, including a variety analyzed in a 1989 paper by Matt Visser, in which a path through the wormhole can be made in which the traversing path does not pass through a region of exotic matter. However in the pure Gauss-Bonnet theory exotic matter is not needed in order for wormholes to exist- they can exist even with no matter. A type held open by negative mass cosmic strings was put forth by Visser in collaboration with Cramer et al., in which it was proposed that such wormholes could have been naturally created in the early universe.

Wormholes connect two points in spacetime, which means that they would in principle allow travel in time, as well as in space. In 1988, Morris, Thorne and Yurtsever worked out explicitly how to convert a wormhole traversing space into one traversing time. However, it has been said a time traversing wormhole cannot take you back to before it was made but this is disputed.



Faster-than-light travel:- Special relativity only applies locally. Wormholes allow superluminal (faster-than-light) travel by ensuring that the speed of light is not exceeded locally at any time. While traveling through a wormhole, subluminal (slower-than-light) speeds are used. If two points are connected by a wormhole, the time taken to traverse it would be less than the time it would take a light beam to make the journey if it took a path through the space outside the wormhole. However, a light beam traveling through the wormhole would always beat the traveler. As an analogy, running around to the opposite side of a mountain at maximum speed may take longer than walking through a tunnel crossing it. You can walk slowly while reaching your destination more quickly because the distance is smaller.

Time Travel:- A wormhole could allow time travel. This could be accomplished by accelerating one end of the wormhole to a high velocity relative to the other, and then sometime later bringing it back; relativistic time dilation would result in the accelerated wormhole mouth aging less than the stationary one as seen by an external observer, similar to what is seen in the twin paradox. However, time connects differently through the wormhole than outside it, so that synchronized clocks at each mouth will remain synchronized to someone traveling through the wormhole itself, no matter how the mouths move around. This means that anything which entered the accelerated wormhole mouth would exit the stationary one at a point in time prior to its entry.



It is thought that it may not be possible to convert a wormhole into a time machine in this manner; some analyses using the semi-classical approach to incorporating quantum effects into general relativity indicate that a feedback loop of virtual particles would circulate through the wormhole with ever-increasing intensity, destroying it before any information could be passed through it, in keeping with the chronology protection conjecture. This has been called into question by the suggestion that radiation would disperse after traveling through the wormhole, therefore preventing infinite accumulation. The debate on this matter is described by Kip S. Thorne in the book Black Holes and Time Warps. There is also the Roman ring, which is a configuration of more than one wormhole. This ring seems to allow a closed time loop with stable wormholes when analyzed using semi-classical gravity, although without a full theory of quantum gravity it is uncertain whether the semi-classical approach is reliable in this case.

Conclusion:- So far, physicists haven't determined a way in which wormholes would form naturally in the Universe. However, theoretical physicist John Wheeler said it's possible that wormholes may spontaneously appear and disappear, according to his quantum foam hypothesis (the idea that virtual particles are, quite weirdly, popping in and out of existence at all times).

Unfortunately, Wheeler theorized that these impromptu wormholes would be super small, appearing at the Planck scale. That's about 10-33 centimeters long. In other words, the wormhole would be so small that it'd be almost impossible to detect.

Let's suppose, however, that we could find tiny wormholes as they pop into existence: We might be able to make them bigger. And to do that, you'd need a funky material called exotic matter. Exotic matter is a little bit different. It's matter that has negative energy density and/or negative pressure.

Negative properties of exotic matter might push the sides of a wormhole outward, making it large enough—and stable enough—for a person or a spaceship to fit through it. Except exotic matter isn't exactly easy to come by; it exists only in theory, we don't know what it looks like, and we have yet to know where to find it.

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India's Mars and Moon Missions: Implications for National Security

Ayan Ghosh
Lecturer, Science & Humanities

Introduction:

The Moon and Mars have stirred the imagination of space scientists since ages because of their relative proximity to Earth, as compared with other heavenly bodies. The Moon, located at a distance of 38,000 km, is the heavenly body nearest to the Earth. It is natural that our satellite remained the object of the first research since the beginning of the Space Age. Mars, the fourth planet in the solar system after Earth, has a year of 687 days and a day which differs from the Earth-day by a little less than half an hour; it is smaller as well as lighter than the Earth and less dense too with its gravity just about 38 percent of the gravity on Earth. It has two satellites: Phobos and Deimos. Soon after the dawn of the Space Age in 1957, both the US and erstwhile USSR initiated numerous projects to carry out wide-sweeping reconnaissance of the solar system, including the Moon and Mars, during the 1960s and 1970s. This was followed by increasing European and Japanese activities in the area of interplanetary exploration in 1980. Since then, there has been an overall continuity in nations attempting interplanetary exploration. India, with its robust space programme, has been making steady progress in deep space exploration, along with other space-faring nations right from the beginning.

Evolution of Interplanetary Exploration:

Since 1957 (the year in which Sputnik I was launched), space-faring nations have made sustained efforts towards interplanetary exploration to Mars, Venus and minor bodies such as the Martian moons, asteroids and comets. Between 1960 and 1985, a total of 19 Soviet probes were sent to Venus. Some of the spacecraft (most notably Veneras 11 and 12), which reached the planet"s surface, transmitted black and white as well as colour photographs of the planet, soil analyses and radar imaging maps of the Venusian surface. Similarly, several lunar exploration programmes were undertaken by the space-faring nations in the 1970s and 1980s. These activities were targeted to establish a manned lunar base, which could then be followed by sending a mission to Mars. Various outer planets exploration missions were sent to Jupiter and Saturn in the 1990s by the US and the erstwhile USSR. Exploration of outer space has indeed become integral to the global and national socio-economic development activities of most progressive space-faring nations.

Renewed Interest by Space-Faring Nations on Missions to Mars/Moon:

The last few years have seen a revival of the focus of major space-faring nations on missions to Mars/ Moon aimed to extend their strategic leverage in space, besides the national prestige that such endeavors provide. In 2004, the National Aeronautics and Space Administration (NASA) declared its intention to withdraw from the International Space Station (ISS) program and aim for the Moon instead. Unlike the ISS, the technological components of the future lunar infrastructure are reportedly planned to be developed by the USA largely domestically, with the involvement of very few other nations or overseas contractors. In July 2011, the US closed down its Space Shuttle programme and paved the way for private companies to run the same. A major chunk of the NASA money, thus, available was redirected to fund robotic missions to Mars as well as asteroids (between Mars and Jupiter) to be followed by manned missions.

These endeavors by the US and other space-faring nations are a clear indication that missions to Mars/Moon will remain the arena of future space endeavors. Manned missions to the Moon and expeditions to Mars are duly factored in the long-term planning of these space-faring nations. India, which possesses the capability to design and develop satellites as well as satellite launch vehicles, took note of this trend quite early and is well on board towards carrying out such deep space missions.

The aim behind the Mars/Moon missions needs to be clearly understood. Control of portions of outer space, be it planets such as Mars/Moon or other planets/comets, is a natural extension of other forms of territorial control. Hence, control of key geographical regions in space and exploiting these for one"s own strategic advantage is the thrust area for all space-faring nations. These strategic areas in space include libration points, huge areas where the gravity of one planet counter balances the gravity of another planet. Libration points are, therefore, devoid of any gravity and can house space objects in vacuum- like conditions with minimal requirements of fuel. In 2011, the European Space Agency (ESA) placed the Herschel Space Observatory in one such libration point located 11.5 lakh km away from Earth.

Other goals for the lunar/martian programme could include establishment of a habitat, mining of natural resources and construction of low gravity production lines, and transfer of dangerous manufacturing operations from

Earth to the Moon. Even construction of a power system that runs from lunar resources or establishment of propellant production/ astronomical facilities on the Moon/ Mars is envisaged in the future. Which country will be the first to build a permanent outpost/ habitat on the Mars/ Moon or on the other parts of the solar system? These are questions, the answers to which will provide a clue to the nature/ ownership of habitats in space.

India's Mars Orbiter Mission (MOM):

Although the mission to Mars was contemplated by the ISRO scientists since 2007 and studies for such a mission also commenced during the same period, the concept of MOM was formulated utilizing the experience gained from Chandrayaan-I by the finalization of the feasibility report in 2010. The study report was prepared in just three months under the guidance of V Adimurthy, Senior Adviser, ISRO and Dean at the Indian Institute of Space Science and Technology. The project was sanctioned on August 03, 2012. The total project cost is about Rs 454 crore, of which the satellite cost is about Rs 153 crore and the rest of the budget has been used for the ground station and other facilities.

The MOM spacecraft began its journey on November 05, 2013, after a flawless lift-off from Sriharikota using the PSLV rocket C25. The spacecraft spent about a month in Low Earth Orbit (LEO), where it made a series of seven altitude raising orbital manoeuvres before making the trans-Mars injection on November 30, 2013. India achieved yet another strategic milestone in space, thereby enhancing its soft power further, when the ISRO scientists successfully manoeuvred their Mars Orbiter Mission (MOM) spacecraft into the martian orbit, after 298 days transit, on September 24, 2014. With the accomplishment of this project, ISRO became the fourth space agency to do so, after the Soviet Space Programme, NASA and the European Space Agency. Keeping in mind the complexity of a mission to Mars as also the high failure rate of previous martian missions of other nations (the success rate of international missions to Mars is only 42 percent), the first successful interplanetary mission of ISRO is indeed laudable. It may be mentioned here that China‟s Mars mission, Yinghuo-1, as well as Russia‟s Phobos-Grunt mission to the Red Planet failed in 2011. India also became the first nation to reach the Mars orbit in its first attempt.

Currently, the MOM spacecraft is orbiting Mars just 421.7 km at its closest point and about 76,993.6 km at the farthest point in an elliptical orbit. The spacecraft is being monitored from the Space Craft Control Centre at the ISRO Tracking, Telemetry and Command Network (ISTRAC) in Bangalore, with support from the Indian Deep Space Network (IDSN) antenna at Byalalu. The 475-kg spacecraft has five scientific instruments on board to study the surface of Mars for water, methane and its mineral and chemical composition. An important objective is to establish the presence of methane, which, if confirmed, will provide an indication about the existence of life on the Red Planet in some form. The mission is a „technology demonstrator‟ project to develop the technologies for design, planning, management and operations of an interplanetary deep space mission. It may be highlighted that a unique aspect of India‟s MOM project is the cooperation and support that India has received from NASA, whose MAVERN spacecraft was injected into the martian orbit exactly three days before MOM, on September 21, 2014. On September 30, 2014, NASA and ISRO officials signed an agreement to establish a pathway for future joint missions to explore Mars. One of the joint objectives is to explore potential coordinated observations and science analysis between the MAVERN orbiter and MOM as well as other current and future Mars missions.

Mars Mission's Contribution to India's National Security:

Another relatively unknown dimension of India‟s space program is the vision of ISRO in creating an indigenous industrial base. ISRO has been very successful in indigenous development of technologies, executing technology transfers and ultimately pulling through manufacturing, testing and assembling in Indian industries, both private as well as public industry. This has also percolated to India‟s ground segment for telecommunication and remote sensing wherein about 20,000 persons are always employed by IS RO. This has helped considerably in the manpower management within ISRO, which allows the premier agency to task the ISRO scientists to concentrate more on meaningful R&D, and the routine manufacture, with good quality and reliability, has been
handed over to the industry. Currently, more than half of ISRO‟s budget is expended by the Indian private industry, proving beyond doubt the substantial use of Indian private industry. There are about 500 odd industries in the country, small, medium and big, which are used for India‟s space program. As regards MOM, as many as 125 Indian firms participated in the project, in areas such as making of the space launch vehicle, payload or ground systems.

India, along with China, leads the world in the development of space- based telemedicine and distance education applications. The Indian model of autonomous space development has inspired many emerging space powers such as Brazil and Turkey. ISRO has demonstrated how through focus and dedication, Indian talent can be harnessed to

International levels, catching up with much more advanced nations in a highly technical and sophisticated field. In space technology, Indian scientists stand shoulder to shoulder with the best in the world and the expertise acquired by the Indian space programme over the decades has made ISRO a very important player in any future space related development. Moreover, a viable and vigorous Indian space industry has become a key part of the increasing self-reliance of India. It continues to pursue excellence in every facet of the space/industry relationship to ensure that the industries supporting the space sector are efficient and internationally competitive. ISRO is also taking inspiration from Arianespace, a commercial satellite launch company representing 10 European countries, to create a similar entity in India in the near future. By 2019, it is expected that space related products will start coming out from such an entity.

Lessons for Indian Defence R&D:

India, which has excelled in the space sector and which aspires for membership of the Security Council, will have to achieve self-reliance in defence related technology sooner rather than later. As such, the economic and strategic significance of the Indian defence sector is growing day by day due to the dynamic geo-political situation. To achieve substantial self-reliance in the design, development and production of systems required for the defence force, the Indian military needs to adopt the ISRO model. India needs a strong defence industry which is able to manufacture and help maintain the capabilities which are fundamental for the defence of India. The successful launches and orbital deployment of Chandrayaan-I as well as MOM has not only put India on a high pedestal amongst the select comity of space-faring nations, but has also paved the way for accelerated development of ISRO‟s future goals such as landing of an unmanned rover on the Moon, human space flight, ASTROSAT, etc. The resounding success of India‟s Mars mission has demonstrated the country‟s capability of designing an autonomous spacecraft that travelled for 300 days before entering the Mars orbit.

Conclusion:

This validation of India‟s growing capability to design and develop space related components, will ultimately contribute to enhanced national security in many ways. In future, India along with other space-faring nations would be aspiring to further hone its technological capabilities in the exploration of the Moon and Mars to improve the national security environment and national technological prestige. Given its brilliant track record, the day is not far off when ISRO will eventually design, develop and launch a lunar as well as martian lander that will deliver a rover and subsequently humans on the surface of the Moon and Mars.

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HORRIBLE EFFECTS OF NOISE POLLUTION

Sanjib Mukherjee
Lecturer, Science & Humanities

Abstract: Noise pollution is the excessive noise that may harm the activity or balance of human being. The source of most noise worldwide is mainly caused by atmospheric noise/environmental noise/occupational noise such as industrial machines, transportation systems and indoor noise generated by machines (particularly in some workplaces), building activities, domestic appliances and music performances etc. The construction and industrial machineries frequently exposes its employees to hazardous noise levels and at the same time adds greatly to community noise. Noise may not be high enough to damage hearing (within buildings) and however the same have an adverse effect on general human health. Transportation contributes largely to environmental noise. The government of different countries has rules & regulations against the hazardous noise sources, but enforcement seems to be lenient. Noise laws and ordinances vary widely across the globe.

Key points - atmospheric noise, environmental noise, occupational noise.

I. Introduction: Noise pollution, also known as environmental noise, is the propagation of noise with harmful impact on the activity of human or animal life. The source of outdoor noise worldwide is mainly caused by machines, transport and transportation systems. Poor urban planning may give rise to noise pollution, side-by-side industrial and residential buildings can result in noise pollution in the residential areas. The main sources of noise in residential area are loud music and loud barking by domestic dogs. It can also be loud talking or shouting by humans although this last is less persistent. Noise pollution associated with household electricity generators is an emerging environmental degradation in many developing nations. The average noise level of 97.60 dB obtained exceeded the WHO value of 50 dB allowed for residential areas. Research suggests that noise pollution is the highest in low-income and racial minority neighbourhoods. Documented problems associated with urban environment noise go back as far as ancient Rome

High noise levels can contribute to cardiovascular effects in humans and an increased incidence of coronary artery disease. In animals, noise can increase the risk of death by altering predator or prey detection and avoidance, interfere with reproduction and navigation, and contribute to permanent hearing loss.[7]While the elderly may suffer from cardiac problems due to noise, children to suffer much from it and can suffer permanent damage for life. According to the World Health Organization children are especially vulnerable to noise. Noise poses a serious threat to a child's physical and psychological health, including learning and behaviour.

II. Understanding Noise Pollution

Most of us are very used to the sounds we hear in everyday life. Loud music, the television, people talking on their phone, the traffic and even pets barking in the middle of the night. All of these have become a part of the urban culture and rarely disturb us. However, when the sound of the television keeps you from sleeping all night or the traffic starts to give you a headache, it stops becoming just noise and start turning into noise pollution. For many of us, the concept of pollution is limited to nature and resources. However, noise that tends to disrupt the natural rhythm of life makes for one solid pollutant.

By definition, noise pollution takes place when there is either excessive amount of noise or an unpleasant sound that causes temporary disruption in the natural balance. This definition is usually applicable to sounds or noises that are unnatural in either their volume or their production. Our environment is such that it has become difficult to escape noise. Even electrical appliances at home have a constant hum or beeping sound. By and large, lack of urban planning increases the exposure to unwanted sounds. This is why understanding noise pollution is necessary to curb it in time.

III. Sound pollution measuring apparatus

A **sound level meter** is used for acoustic (sound that travels through air) measurements. It is commonly a hand-held instrument with a microphone. The diaphragm of the microphone responds to changes in air pressure caused by sound waves. That is why the instrument is sometimes referred to as a Sound Pressure Level (SPL) Meter. This movement of the diaphragm, i.e. the sound pressure deviation (pascal Pa), is converted into an electrical signal (volts V).

A microphone is distinguishable by the voltage value produced when a known, constant sound pressure is applied. This is known as the microphone sensitivity. The instrument needs to know the sensitivity of the particular microphone being used. Using this information, the instrument is able to accurately convert the electrical signal back to a sound pressure, and display the resulting sound pressure level (decibels dB SPL).

Sound level meters are commonly used in noise pollution studies for the quantification of different kinds of noise, especially for industrial, environmental and aircraft noise. The current international standard that specifies sound level meter functionality and performances is the IEC 61672-1:2013. However, the reading from a sound level meter does not correlate well to human-perceived loudness, which is better measured by a loudness meter. Specific loudness is a compressive nonlinearity that depends on level and also frequency, which can be calculated in a number of different ways.

IV. Sources of noise pollution

This type of pollution is so omnipresent in today's society that we often fail to even notice it anymore:

- Street traffic sounds from cars, buses, pedestrians, ambulances etc.
- construction sounds like drilling or other heavy machinery in operation
- airports, with constant elevated sounds from air traffic, i.e. planes taking off or landing
- workplace sounds, often common in open-space offices
- constant loud music in or near commercial venues
- industrial sounds like fans, generators, compressor, mills
- train stations traffic
- household sounds, from the television set to music playing on the stereo or computer, vacuum cleaners, fans and coolers, washing machines, dishwashers, lawnmowers etc.
- Events involving fireworks, firecrackers, loudspeakers etc.
- Conflicts generate noise pollution through explosions, gunfire etc. The dysfunctions, in this case, are likely caused by the conflict and insecurity and less by the noise pollution in itself, although that compounds stress levels too.

V. Effects of Noise Pollution on Wildlife and Marine Life

Our oceans are no longer quiet. Thousands of oil drills, sonars, seismic survey devices, coastal recreational watercraft and shipping vessels are now populating our waters, and that is a serious cause of noise pollution for marine life. Whales are among the most affected, as their hearing helps them orient themselves, feed and communicate. Noise pollution thus interferes with cetaceans' (whales and dolphins) feeding habits, reproductive patterns and migration routes, and can even cause hemorrhage and death.

Other than marine life, land animals are also affected by noise pollution in the form of traffic, firecrackers etc., and birds are especially affected by the increased air traffic.

VI. Male ornaments and habitat deterioration

Anthropogenic noise arising from urbanization and traffic influences the transmission of auditory sexual signals and restricts acoustic communication. A good example of this is the song of great tits *Parus major* that is masked by human-induced low frequency noise in urban areas. Slabbekorn and Peet found that birds that nest at noisy locations have to sing with a higher minimum frequency to prevent their song from being masked.

Underwater noise pollution from shipping can similarly influence communication in aquatic environments. For instance, noise from ferry boats lies within the most sensitive hearing range of the Lusitanian toadfish *Halobatrachus didactylus*. Vasconcelos and coworkers found the noise to increase the auditory threshold of the toadfish. This hampered the ability of the fish to detect acoustic signals from conspecifics. Since the auditory signals are essential during agonistic encounters and mate attraction, ferry boat noise could influence mate choice in the species. Similarly, Foote and coworkers found acoustic communication in whales to be restricted by the engine noise of whale watcher boats. To adjust for the anthropogenic noise, whales increase the duration of their primary calls in the presence of boats.

VII. Human Diseases Caused by Noise Pollution

Whether we realize we are subjected to it or not, noise pollution can be hazardous to our health in various ways.

- **Hypertension** is, in this case, a direct result of noise pollution caused elevated blood levels for a longer period of time.
- **Hearing loss** can be directly caused by noise pollution, whether listening to loud music in your headphones or being exposed to loud drilling noises at work, heavy air or land traffic, or separate incidents in which noise levels reach dangerous intervals, such as around140 dB for adult or 120 dB for children.
- **Sleep disturbances** are usually caused by constant air or land traffic at night, and they are a serious condition in that they can affect everyday performance and lead to serious diseases.
- **Child development**. Children appear to be more sensitive to noise pollution, and a number of noise-pollution-related diseases and dysfunctions are known to affect children, from hearing impairment to psychological and physical effects. Also, children who regularly use music players at high volumes are at risk of developing hearing dysfunctions. In 2001, it was estimated that 12.5% of American children between the ages of 6 to 19 years had impaired hearing in one or both ears
- Various **cardiovascular dysfunctions**. Elevated blood pressure caused by noise pollution, especially during the night, can lead to various cardiovascular diseases.
- **Dementia** isn't necessarily caused by noise pollution, but its onset can be favoured or compounded by noise pollution.
- **Psychological dysfunctions** and noise annoyance. Noise annoyance is, in fact, a recognized name for an emotional reaction that can have an immediate impact.

VIII. Social and Economic Costs of Noise Pollution

The World Health Organization estimates that one out of three people in Europe is harmed by traffic noise. More than the purely medical effects of noise pollution on the individual, there is a significant social and economic impact. Since noise pollution leads to sleep disturbance, it affects the individual's work performance during the day, it leads to hypertension and cardiovascular disease and costs the health system additional time and money, and it negatively affects school performance in children.

IX. Importance of the environment

It is astonishing how inappropriate our living environments are for life at any age. But with increasing age, both “normal” changes and age-associated illnesses interact with the environment in ways that can be extremely negative. Poor lighting and poor signage each make it impossible for people to find their way. Noise pollution (a bane of today's society) often takes the form of background noise and makes the partially hearing-impaired individual unable to comprehend conversations. Clutter and complications in the environment increase the likelihood of falling, fearfulness, and inability to get around. Familiar, convenient, well-lit surroundings with the right acoustics could improve the functionality of all individuals, especially as they age. Ironically, the settings in which clinicians assess patients are frequently appalling environments in relation to these characteristics, and the situation is compounded by the anxiety that many individuals feel in a clinical setting. Clinicians are frequently asked to assess a person's cognitive capabilities (and functional capacity) in conditions very unlike those in which the person lives. This is why the home circumstances must be assessed, or at least known about, for decisions to be made about home safety and the appropriateness of the environment to which a patient's discharge is planned. Doctors' offices are not designed for older patients either. Tables are too high, even dangerous, and the corridors may be threatening, lacking the handholds that should be on the walls.

The environment of nursing homes is unspeakably inappropriate in many cases. It is well known that a calming, quiet, soothing environment with healthy reminiscences, well-lit, warm and welcoming, and home-like, really does help to calm behavioral and emotional disturbances in those with and without dementia. So why are nursing homes designed to look like rather unwelcoming convenience stores? Where are the carpeting and drapes? Why does everyone need to be harassed by loud alarms that are intended only to alert nurses to patients in danger? Clinicians should speak out, rather than merely respond with increasing doses of psychotropic medications for patients who may in part be merely suffering from the chronic disruption of an aggressive and noisy environment.

X. Tips for Avoiding Noise Pollution

- Wear earplugs whenever exposed to elevated noise levels
- Maintain a level of around 35 dB in your bedroom at night, and around 40 dB in your house during the day
- If possible, choose your residential area as far removed from heavy traffic as you can
- Avoid prolonged use of earphones, especially at elevated sound levels
- If possible, avoid jobs with regular exposure to elevated sound levels

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A STUDY ON TIDAL ENERGY AND TIDAL POWER GENERATION STATIONS IN INDIA

Pushmita Bhattacharya, Lecturer,

Science & Humanities Department

Abstract: Tidal power or tidal energy is a form of hydropower that converts the energy obtained from tides into useful forms of power, mainly electricity. Although not yet widely used, tidal energy has potential for future electricity generation. Tides are more predictable than the wind and the sun. Among sources of renewable energy, tidal energy has traditionally suffered from relatively high cost and limited availability of sites with sufficiently high tidal ranges or flow velocities, thus constricting its total availability. However, many recent technological developments and improvements, both in design (e.g. dynamic tidal power, tidal lagoons) and turbine technology (e.g. new axial turbines, cross flow turbines), indicate that the total availability of tidal power may be much higher than previously assumed, and that economic and environmental costs may be brought down to competitive levels.

Introduction

Historically, tide mills have been used both in Europe and on the Atlantic coast of North America. The incoming water was contained in large storage ponds, and as the tide went out, it turned waterwheels that used the mechanical power it produced to mill grain. The earliest occurrences date from the Middle Ages, or even from Roman times. The process of using falling water and spinning turbines to create electricity was introduced in the U.S. and Europe in the 19th century.[1]The world's first large-scale tidal power plant was the Rance Tidal Power Station in France, which became operational in 1966. It was the largest tidal power station in terms of output until Sihwa Lake Tidal Power Station opened in South Korea in August 2011. The Sihwa station uses sea wall defense barriers complete with 10 turbines generating 254 MW.

Tidal power is taken from the Earth's oceanic tides. Tidal forces are periodic variations in gravitational attraction exerted by celestial bodies. These forces create corresponding motions or currents in the world's oceans. Due to the strong attraction to the oceans, a bulge in the water level is created, causing a temporary increase in sea level. As the Earth rotates, this bulge of ocean water meets the shallow water adjacent to the shoreline and creates a tide. This occurrence takes place in an unfailing manner, due to the consistent pattern of the moon’s orbit around the earth.The magnitude and character of this motion reflects the changing positions of the Moon and Sun relative to the Earth, the effects of Earth's rotation, and local geography of the sea floor and coastlines.

Tidal Energy Generation

Since the position of the earth and the moon with respect to the sun changes throughout the year, we can utilize the potential energy of the water contained in the daily movement of the rising and falling sea levels to generate electricity. The generation of electricity from tides is similar in many ways to hydro-electric generation we

looked at in the hydro energy tutorials. The difference this time is that the water flows in and out of the turbines in both directions instead of in just one forward direction.

Tidal energy, just like hydro energy transforms water in motion into a clean energy. The motion of the tidal water, driven by the pull of gravity, contains large amounts of kinetic energy in the form of strong tidal currents called tidal streams.[2] The daily ebbing and flowing, back and forth of the oceans tides along a coastline and into and out of small inlets, bays or coastal basins, is little different to the water flowing down a river or stream.

The movement of the sea water is harnessed in a similar way using waterwheels and turbines to that used to generate hydro electricity. But because the sea water can flow in both directions in a tidal energy system, it can generate power when the water is flowing in and also when it is ebbing out. Therefore, tidal generators are designed to produce power when the rotor blades are turning in either direction. However, the cost of reversible electrical generators are more expensive than single direction generators.

An overview of different Tidal Power Station Worldwide

- The Rance tidal power plant built over a period of 6 years from 1960 to 1966 at La Rance, France.It has 240 MW installed capacity.
- 254 MW Sihwa Lake Tidal Power Plant in South Korea is the largest tidal power installation in the world. Construction was completed in 2011.
- The first tidal power site in North America is the Annapolis Royal Generating Station, Annapolis Royal, Nova Scotia, which opened in 1984 on an inlet of the Bay of Fundy.It has 20 MW installed capacity.
- The Jiangxia Tidal Power Station, south of Hangzhou in China has been operational since 1985, with current installed capacity of 3.2 MW. More tidal power is planned near the mouth of the Yalu River.
- The first in-stream tidal current generator in North America (Race Rocks Tidal Power Demonstration Project) was installed at Race Rocks on southern Vancouver Island in September 2006.The next phase in the development of this tidal current generator will be in Nova Scotia (Bay of Fundy).
- A small project was built by the Soviet Union at Kislaya Guba on the Barents Sea. It has 0.4 MW installed capacity. In 2006 it was upgraded with a 1.2MW experimental advanced orthogonal turbine.
- Jindo Uldolmok Tidal Power Plant in South Korea is a tidal stream generation scheme planned to be expanded progressively to 90 MW of capacity by 2013. The first 1 MW was installed in May 2009.
- A 1.2 MW SeaGen system became operational in late 2008 on Strangford Lough in Northern Ireland.
- The contract for an 812 MW tidal barrage near Ganghwa Island (South Korea) north-west of Incheon has been signed by Daewoo. Completion is planned for 2015.
- A 1,320 MW barrage built around islands west of Incheon is proposed by the South Korean government, with projected construction starting in 2017.

- The Scottish Government has approved plans for a 10MW array of tidal stream generators near Islay, Scotland, costing 40 million pounds, and consisting of 10 turbines – enough to power over 5,000 homes. The first turbine is expected to be in operation by 2013.
- The Indian state of Gujarat is planning to host South Asia's first commercial-scale tidal power station. The company Atlantis Resources planned to install a 50MW tidal farm in the Gulf of Kutch on India's west coast, with construction starting early in 2012.
- Ocean Renewable Power Corporation was the first company to deliver tidal power to the US grid in September, 2012 when its pilot TidGen system was successfully deployed in Cobscook Bay, near Eastport.
- In New York City, 30 tidal turbines will be installed by Verdant Power in the East River by 2015 with a capacity of 1.05MW.
- Construction of a 320 MW tidal lagoon power plant outside the city of Swansea in the UK was granted planning permission in June 2015 and work is expected to start in 2016. Once completed, it will generate over 500GWh of electricity per year, enough to power roughly 155,000 homes.
- A turbine project is being installed in Ramsey Sound in 2014.
- The largest tidal energy project entitled MeyGen (398MW) is currently in construction in the Pentland Firth in northern Scotland
- A combination of 5 tidal stream turbines from Tocardo are placed in the Oosterscheldekering, the Netherlands, and have been operational since 2015 with a capacity of 1,2 MW

A Study In Tidal Energy In India .Gujarat Set To Develop India's First Tidal Energy Plant

The Gujarat government is all set to develop India's first tidal energy plant. The state government has approved Rs 25 crore for setting up the 50 MW plant at the Gulf of Kutch. It will produce energy from the ocean tides.The state government signed a MoU with Atlantis Resource Corporation last year to develop the plant. "The proposal was approved in this year's budget session," says Rajkumar Raisinghani, senior executive with Gujarat Power Corporation Limited (GPCL). Atlantis Resource Corporation is a UK-based developer of tidal current turbines. "The equipment has been imported and work will start anytime soon. We are awaiting Coastal Regulation Zone clearance from Ministry of Environment and Forests, which is expected soon," adds Raisinghani. [4]

According to the GPCL officials, if this 50 MW plant is successfully commissioned, its capacity will be increased to 200 MW. As per a study conducted by Atlantis Resource Corporation and the state government two years ago, the Gulf of Kutch has a total potential of 300 MW. The biggest operating tidal station in the world, La Rance in France, generates 240 MW. According to the estimates of the Indian government, the country has a potential of 8,000 MW of tidal energy. This includes about 7,000 MW in the Gulf of Cambay in

Gujarat, 1,200 MW in the Gulf of Kutch and 100 MW in the Gangetic delta in the Sunderbans region of West Bengal.

But despite the huge potential, India has no policy on tidal energy. “A clear policy is very important for developers to have clarity on tariff and commercial development of tidal energy in the country,” says Aditya Venketesh, executive director, Urja Global Limited, an Indian company which works in the field of renewable energy. The government must also provide subsidy to reduce the cost of importing wave technology so that consumers can get the cheapest rate on per unit consumption, he adds. The Gujarat government last year approved a 10 MW tidal energy plant proposed by Urja Global Limited in association with a US-based company Ocean Energy Industries. But no date has been given for starting the project yet.

“The Ministry of New and Renewable Energy should prepare a proper policy on tidal energy since the development of this sector is primarily their responsibility,” says an official of the GPCL, wishing anonymity. No developer will come forward unless policy shows assured benefits, he adds.

India possesses tidal energy potential of around 8,000 Mw

Out of the 8,000 MW of tidal energy, 7,000 MW is present in the Gulf of Khambhat, 1,200 MW in the Gulf of Kutch in Gujarat, and about 100 MW in the Gangetic delta in Sunderbans in West Bengal.

Bengal's 100-mega watt (mw) tidal power project, thefirst of its kind in the country, received clearance from the Union ministry of environment and forests in the last week of April. The West Bengal Renewable Energy Development Agency (wbreda) will implement this Rs 40-crore pilot project in the Sunderbans area.

"This eco-friendly project will electrify several Sunderbans villages, benefiting about 200,000 people in the Sunderbanss wbreda managing director P Gon Chaudhuri. Work on the project is slated to start later this year and will take three years to complete. Since the project will serve as a model for bigger plants in the country,the Union ministry of non-conventional energy will bear 90per cent of the cost, Chaudhuri said. The rest of the cost will be covered by the state government.

The Future Of Renewables

With a generation capacity of 3. 6 mw, the project willcomprise two barrages built across the upstream and downstream ends of the Durgaduani creek, which runs between the islands of Gosaba and Bali-Bijayanagar and connects the Bidyadhari and Gomdi rivers. A bypass canal built at the downstream end will have a powerhouse and sluice gates. The plant will run for 14 hours a day (when the tide moves in or out). Electricity generated through an underwater horizontal axis turbine will be transmitted through a local grid to villages in Gosaba block.[3] Currently, these villages are receiving eight hours of after dark power supply daily from a local biomass plant.

Based on a renewable source of energy, tidal power projects are environmentally viable and economic. The simplest known electricity generating system for tidal plants is the ebb generating system, which involves building a barrage across an estuary. Under the system, the sluice gates on the barrage allow the tidal basin to

fill on the in-flowing high tides and then to exit through the turbine system on the ebb tide. Though power is also generated from the inflowing tide inthe flood-generating systems, it is less favored.

The only known environmental disadvantage of a tidal power plant is the effect a tidal station has on the local aquatic and shoreline ecosystems. The change in the water level and possible flooding could affect the local vegetation and birds and fish that feed on it. However, it's difficult to predict the exact ecological impact of tidal plants since every site is different and there are not many projects across the world available for comparison.

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MATHEMATICS IS FUN

Rahul karak
Lecturer, science & humanities

"Mathematics is the art of saying many things in many different ways" - MAXWELL. Some of these ways are sometimes interesting and funny too. Numbers are one of the significant parts of our lives. From studies, career, daily chores to relationships, everything is related to numbers. Therefore Mathematics proves to be an essential subject for students. Even though numbers can be scary sometimes, but if learned properly and with fun, they can be pretty amazing and cool. To make our point, let's see few interesting facts about mathematics:

A very interesting thing about mathematics is how crazy it gets with multiplications. For instance, we have the following:

$$1\times 9+2=11$$
$$12\times 9+3=111$$
$$123\times 9+4=1111$$
$$1234\times 9+5=11111$$
(1) $$12345\times 9+6=111111$$
$$123456\times 9+7=1111111$$
$$1234567\times 9+8=11111111$$
$$12345678\times 9+9=111111111$$
$$12345678\times 9+10=1111111111$$

$$1\times 1=1$$
$$11\times 11=121$$
$$111\times 111=12321$$
$$1111\times 1111=1234321$$
(2) $$11111\times 11111=123454321$$
$$111111\times 111111=12345654321$$
$$1111111\times 1111111=1234567654321$$
$$11111111\times 11111111=123456787654321$$
$$111111111\times 111111111=12345678987654321$$

(3) If you believe in magic then mathematics does it too. Number 9 is believed to be a magic number. It is because if you multiply a number(less than or equal to 10) with 9, add all digits to resulting number, the sum would always come out to be 9.

"Pure mathematics is, in its way, the property of logical ideas"- Albert Einstein.

No matter how nice and simple this quote makes us think mathematics is, we are sure that for many of us, mathematics as a subject seems no less than a nightmare. The calculation which includes alphabets, let alone numbers, was no less than a herculean task to complete. Even though numbers can be scary sometimes, but if learned with analytical approach, they can make serious fun.

(1) For two constants x and n, we know that $x+x+.....+x\,(n\,times)=n\times x=nx$

Therefore we must have $x+x+.....+x\,(x\,times)=x\times x=x^2$

Differentiating both sides with respect x we get $\frac{d}{dx}\{x+x+.....+x\,(x\,times)\}=\frac{d}{dx}\{x^2\}$

or, $\{1+1+.....+1(x\,times)\}=2x$

or, $x=2x$

or, 1 = 2 (since x is non zero, so cancelling from both sides)

So this result seems very scary, because if this is true then the whole system of learning will collapse. But what is the point we missing?

Remember when we learn derivative, in the formulas like $\frac{d}{dx}\{x^n\} = nx^{n-1}$, x is a variable, and derivative of constant is zero. So obviously when we take derivative in both sides of $x + x + ...+ x\,(x\ times) = x \times x = x^2$, both sides will be zero.

(2) Can we express any integer using three 2's only?

Surely we can. We just have to use logarithm properly.

$$n = -\log_2 \log_2 \left(\underbrace{\sqrt{\sqrt{.....\sqrt{2}}}}_{n\,times} \right),$$

$$-n = \log_2 \log_2 \left(\underbrace{\sqrt{\sqrt{.....\sqrt{2}}}}_{n\,times} \right),$$

$$0 = \log_2 \log_2 2.$$

Let us prove one of the above.

$$-\log_2 \log_2 \left(\underbrace{\sqrt{\sqrt{.....\sqrt{2}}}}_{n\,times} \right) = -\log_2 \log_2 2^{\frac{1}{2^n}} = -\log_2 \log_2 2^{2^{-n}} = -\log_2 2^{-n} \log_2 2 = -\log_2 2^{-n}$$

$$= -(-n \log_2 2) = -(-n) = n$$

(3) Which of the following is true?

(a) $\frac{1}{i} = \frac{\sqrt{1}}{\sqrt{-1}} = \frac{\sqrt{(-1)\times(-1)}}{\sqrt{-1}} = \frac{\sqrt{-1}\times\sqrt{-1}}{\sqrt{-1}} = \sqrt{-1} = i$

(b) $\frac{1}{i} = \frac{1\times i}{i\times i} = \frac{i}{i^2} = \frac{i}{-1} = -i$

Well, if (a) is true then we can get $1 = \sqrt{1} = \sqrt{(-1)\times(-1)} = \sqrt{(-1)} \times \sqrt{(-1)} = i \times i = i^2 = -1$, a blunder.

Here we must remember that $\sqrt{a \times b} = \sqrt{a} \times \sqrt{b}$ only when both a and b are nonnegative. So without systematic approach mathematics can be a nightmare but if the logics are there then obviously it can produce fun.