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2017-18

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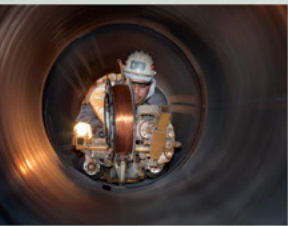


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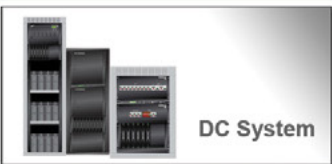


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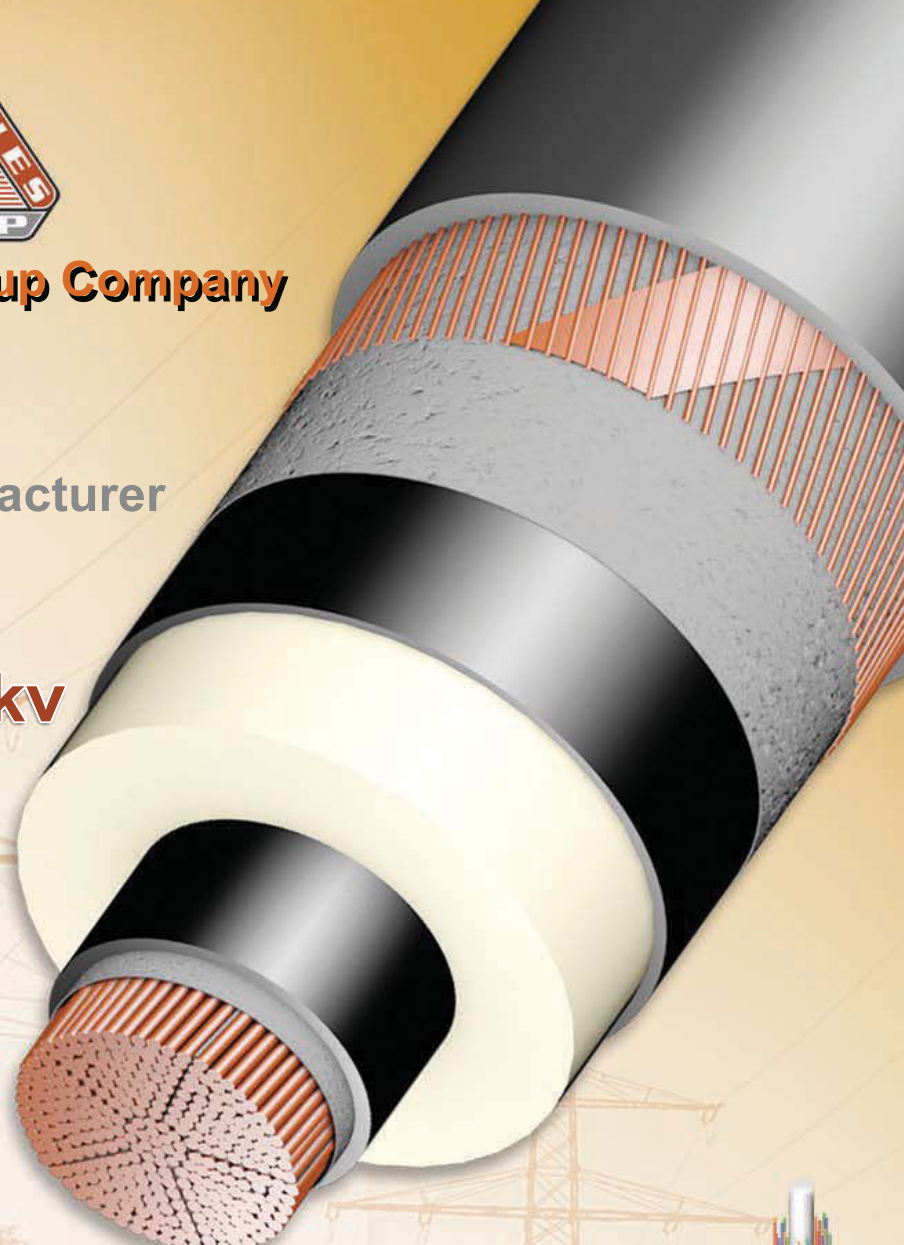


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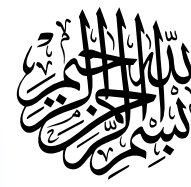


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Editor

IEP-SAC Journal is published yearly by the Institution of Engineers Pakistan, Saudi Arabian Center (IEP-SAC), Riyadh, and distributed to the engineering community in Saudi Arabia. To promote discussion of issues in the field of engineering and ensure coverage of all responsible points of view, conflicting opinions and views may appear, however, IEP-SAC cannot accept any liability for such views nor for any errors or omissions.

Designed By: Omer Khan
(Cell: 055 112 7434)

Email: fanoontamaus@gmail.com

From the Chairman's Desk

Thanks to Almighty Allah IEP-SAC has generated immense good will for its motherland with its high standard of professionalism and excellence. IEP-SAC continued to contribute to the Technical know how and expertise of engineers by organizing Technical Seminars, publishing Engineering Journal and conducting technical meetings.

Science and technology is the core growth driver in the 21st century. Policy makers cannot ignore its interplay with entrepreneurship and focus solely on "BRIKS AND MORTOR."

From this forum, we have been insisting on the importance of knowledge economy and to develop the intellectual capital. In other words more budgeting on higher education of Science and Engineering. However it is alarming that the gross domestic expenditure on research and development is declining from 0.7 % in 2007 to just 0.35 % in 2014.

Our noble endeavor has been the award of Scholarships to the needy students in public universities and colleges in Pakistan and Azad Kashmir. Alham-do-Lillah it has attained unprecedented altitude. This could be possible only due to dedicated volunteer service of our Council members, support of our sponsors and advertisers for which IEP-SAC is grateful to them.

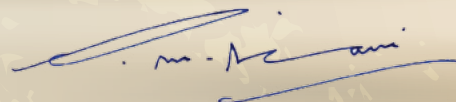
Thanks to the publication committee for providing new IEP-SAC Journal which contains important articles. We hope readers will like it.

It is worth mentioning that all of our efforts to organize Seminars, Social events and publication of Journals are due to absolute volunteer service of IEP-SAC members for which they deserve admiration from the entire engineering community. As a chairman of IEP-SAC I extend my sincere thanks to all Council Members in Central as well as in Eastern and Western region.

We are grateful to HE Ambassador of Pakistan and embassy staff for their continued patronage and support. On behalf of IEP-SAC we wish to express our gratitude to H. M. King Salman bin Abdul Aziz, the custodian of the two holy Mosques and his government for their hospitality and providing opportunity to Pakistani engineers to contribute their share in the development of our brotherly country. At this stage IEP-SAC reiterates its pledge to contribute its dedicated services in achieving the goals set in the vision 2030 for KSA.

Best regards,

Syed Mubashir H. Kirmani



(Chairman, IEP-SAC)





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From The

Charge d' Affaires Embassy of Pakistan



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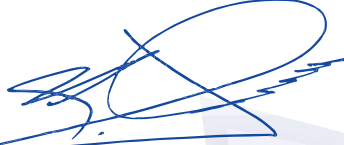


I am pleased to know that the Institution of Engineers of Pakistan Saudi Arabia Chapter (IEP-SAC) publishes a beautiful and informative magazine every year. I am optimistic that the Journal for the year 2017-18 would also provide useful and up-to-date information in the relevant fields to Pakistani Engineers, Architects and Town Planners working in the Kingdom of Saudi Arabia.


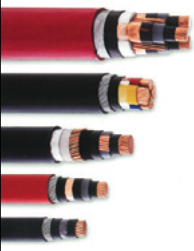

There is no doubt that Engineers from Pakistan have played a significant role in the development of the Kingdom. They are also playing a leading role in the promoting soft image of Pakistan through their hard work, professionalism and commitment. I am confident that Pakistani engineers in the Kingdom will continue to discharge their duties professionally in the future as well. Through their technical know-how and expertise, Pakistani Engineers are our greatest source of bridging the bonds of friendship between Pakistan and Saudi Arabia.





I am also happy to hear about the social and philanthropic activities being undertaken by the Pakistani engineers living in the Kingdom. I pray for the success of IEP-SAC in the drive for this noble cause of awarding scholarships to deserving and needy students studying in various engineering colleges and universities in Pakistan.

I once again extend my best wishes to IEP-SAC and Pakistan Engineers' community for more success in their future endeavors. I assure them of full support of the Embassy of Pakistan in their activities towards promoting goodwill for Pakistan in the Kingdom and their contribution in the development of Saudi Arabia.











(Muhammad Hassan Wazir)
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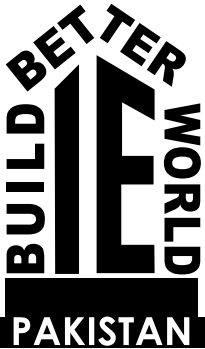
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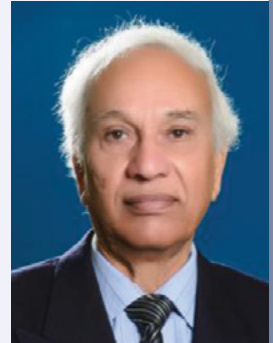
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From The President of IEP



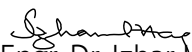
On behalf of the Central Council of The Institution of Engineers, Pakistan and my own behalf, I congratulate IEP) Saudi Arabian Chapter, Riyadh for organizing seminar on Water Issues and publishing the magazine on this occasion.



I am confident that this Seminar will give an opportunity to highlight the serious challenges which Pakistan is going to face in future about water resources. The seminar will also help in identifying the areas which will help to overcome these challenges.

We appreciate the efforts made by The Institution of Engineers Pakistan (IEP) Saudi Arabian Chapter for their untiring efforts to bring together so many local and expatriate engineers working in KSA to share their ideas and expertise. An event of this magnitude is a substantial undertaking and the IEP will reap extensive benefits from their efforts. The sharing of knowledge and building professional ties among the professional engineers and scientists is vital to the advancement of the profession and the continued level of excellence in Engineering.

The continued and consistent efforts of IEP-SAC members for the welfare and advancement of Engineering Community in Saudi Arabia are also praise worthy and highly appreciated.


Engr. Dr. Izhar Ul Haq

President,

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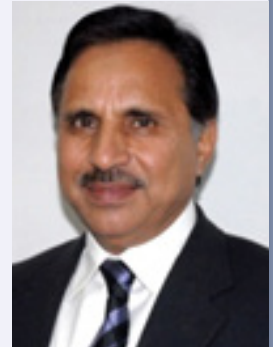
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From The Secretary of IEP

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It is a matter of great pleasure to know that the Institution of Engineers, Pakistan (IEP) Saudi Arabia Centre (IEP-SAC) is organizing a Seminar on important topic of Water Issues and also publishing Annual magazine on this occasion.

Such Seminars play an important role in sharing the technical knowledge and expertise among the fellow Engineers and are a great Contribution in disseminating the technical knowledge.

The efforts of Institution of Engineers Pakistan Saudi Arabia Center (IEP-SAC) in this regard are commendable and deserve highest appreciation. The seminar will definitely help in advancement of Engineering Knowledge and welfare of Engineering Community working in Saudi Arabia.

I wish the event to be a great success.

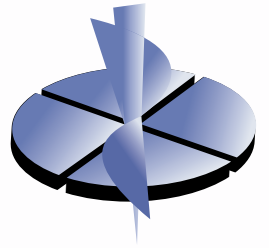
A handwritten signature in blue ink, appearing to read 'Mian Sultan Mahmood'.

Engr. Mian Sultan Mahmood

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From The Saudi Council of Engineers



It gives me immense pleasure to felicitate the Institute of Engineers Pakistan, Saudi Arabian Centre (IEP-SAC) on publication of its annual Journal for the year 2016-17 and holding 45th Technical Seminar.

Saudi Council of Engineers (SCE) is endeavoured to enhance the capabilities of engineers and technicians by approving curricula for qualifying and training at Kingdom level that enable them to practice their profession effectively. SCE is effectively involved in review decisions and code of practices / system in both public and private sectors pertaining to engineering sector and profession, and to suggest appropriate amendments that will contribute to realize the goals of the council. Our society is the first beneficiary of the benefits of our objectives, as such we keep our society abreast of the role of the council and make continuous monitoring for practicing engineering profession in the Kingdom by defining rules, fundamentals and requirements of licensure for practicing engineers and for renewal of registration.

SCE has a role of strategic pivot in collaboration with other Engineering forums for sharing "Know-how" and interaction among them in attaining the prime goals. In this context we are thankful to IEP-SAC and its leadership for their positive response and participation in our professional events.

I wish the Institute of Engineers Pakistan, Saudi Arabian Centre (IEP-SAC) complete success in all their efforts. SCE will be pleased to extend its cooperation as and when needed.

Dr. Jamil Al Bagawi

Chariman

Saudi Council of Engineers



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From The Saudi Council of Engineers



Engineers play key role to increase productivity and the development of any country. As a result, the overall engineering employment is expected to grow by 10 percent per annum over the next decade.

With the current financial crisis and expected recession, overall job opportunities in engineering discipline are still expected to be good, and indeed, prospects will be excellent in certain specialties. The trend for this future demand of engineers that will continue even during economic slowdowns will be on research engineers, high-tech engineers, electronics and aerospace engineers. Therefore, the engineering-discipline development through organizations such as SCE or IEP is an important issue, because the value of engineers depends not only on their knowledge of the latest technology, but also on their interaction, cooperation and networking under the umbrella of such NGOs. The role of such professional societies is important and vital to meet the needs of 21st century.

Saudi Council of Engineers is a professional body that aims to promote the engineering profession and do whatever may be necessary to develop and upgrade its standards and practices.

The main responsibilities of the Council are setting criteria and standards of practicing and developing this profession including licensure terms and conditions; prescribing necessary rules, regulations, and examinations for professional degrees; preparation and publication of studies and researches; organization of Engineering courses, conferences, seminars, workshops and symposiums related to the profession. Promoting engineering profession in the KSA is the main goal of the Council.

The contributions by Pakistan engineers to the development of Saudi Arabia through the past decades are well recognized by SCE. Therefore, Pakistan – Saudi Arabian relationship is a special one, indeed at all levels. For example, another Memorandum of understanding (MOU) has been signed between SCE and IEP on February 3, 2013, addition to the one which was signed in year 2008, by which both parties wishes to develop an active relation through the development of professional services in the fields of engineering accreditation, continuous development training programs, engineering events, and exchange of expertise and knowhow between the two brotherly Islamic countries.

Dr. Hussain Yaha Fadhli

General Secretary
Saudi Council of Engineers



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From The The General Secretary

It is an honour and a source of pleasure and satisfaction to present you the IEP-SAC annual report for the past year 2016-17 along with the new annual journal, which reveals our activities and achievements in providing services to the engineering community in the Kingdom of Saudi Arabia as well as engineering students in Pakistan. Al-hamdolillah it is now my third year of fulfilling the responsibility of IEP-SAC General Secretary with satisfaction since October 2014.

I would like to recall the message delivered by our beloved father of nation, Quaid-e-Azam Mohammad Ali Jinnah, to the first inaugural meeting of IEP on June 20, 1948 in Lahore: *Quote "It will have to take up a good deal of leeway in the realm of scientific and technical education which is so necessary for the proper development of the country and the utilization of its resources. The establishment of institution like INSTITUTE OF ENGINEERS will greatly stimulate technical research and help in disseminating available information. THE INSTITUTE OF ENGINEERS will not only benefit the engineers themselves by improving their technical knowledge but also bring lasting benefits to public services which they are called upon to perform."* Unquote.

In fulfillment of Quaid's expectations from IEP, the Institution of Engineers Pakistan – Saudi Arabian Centre (IEP-SAC) is providing a platform of opportunities to all Pakistani engineers to excel their skills, share practical knowledge with the fellow engineers in the field and help engineering students in Pakistan. Being a non-profitable organization, we are always striving to make advancements in pursuing the main objectives of IEP-SAC, which are summarized below:

- Providing a forum for Pakistani engineers working in the Kingdom of Saudi Arabia to update their professional knowledge through conducting technical seminars and publishing technical papers of Pakistani engineers in the annual journal.
- Interacting with other local organizations related to engineering profession and find opportunities to support Pakistani engineers and safeguard their professional interests in all respects.
- Facilitating communication and enhancement of friendship among Pakistani engineers and their families by organizing family picnics, publishing updated directory of Pakistani engineers working in KSA every year and participating in organization of other social activities.
- Helping the needy and meritorious young Pakistani engineering students of various public universities in Pakistan through an ambitious scholarship program.

A brief report of IEP-SAC activities during the year 2016-17 is given below.

Election Of New Office Bearers:

According to the bye-laws of IEP-SAC, the election of the chairman was held in October 2016 by local council members and Engr. Syed Mubashir Hussain Kirmani was re-elected as chairman second time for the next biennial term 2016-18. Later on, he nominated Engr. Syed Muhammad Iqbal Ahmed as General Secretary, who further nominated Engr. Muhammad Asim Siddiqui as Joint Secretary. The council ratified both nominations.

After re-election, chairman briefed that he do not feel to propose any change in the present conveners of IEP-SAC standing committees, until and unless specifically required in future for any arising situation. The updated list of IEP-SAC committees with conveners has been given in subsequent pages of the journal.

Annual Convention and Seminars:

Our technical seminars are designed to enhance the professional knowledge and increase awareness of Pakistani engineers about new advancements in the technology. Last year, IEP-SAC organized its annual convention with seminar on 14th May 2016 at King Salman Social Center, Riyadh. The topic of technical seminar # 45 was, "Renewable Energy: Opportunities, Challenges and Future Trends" presented by Engr. Mohammad Tahir Chaudhry, GM (Middle East) – Sun Power Corporation (USA). The speaker encompassed in depth the kinds of renewable energies with particular emphasis on solar power. He addressed the opportunities and challenges of solar power in KSA and Pakistan with solutions in the light of future trends of development in this field.

As usual, the exhibition of various engineering products and services of suppliers and manufacturers was also made before the start of the seminar. Shields were presented to the co-sponsors in recognition of their contribution towards IEP-SAC scholarship program. Certificates of appreciation were presented to the authors of various technical papers published in the last year annual journal. Attendance certificates were also issued to all attendees of the seminar at the end of the program.

Our midterm technical seminar # 46 was held on 18th November, 2016 at Marhaba Banquet Hall, Olaya Road, Riyadh. The topic was, "Engineering Contract Management" presented by Engr. Yousuf Bashir Khawaja MCI Arb (UK), MS (CM), BS (Civil), FIDIC Certified Manager, working as Manager Contracts – Yuksele Insatt A. S. KSA. The speaker covered all aspects of various types of engineering contracts including offer, acceptance, execution, breach of contract conditions, its effect and legal actions. He also explained the effects and legal implications of abnormal



termination of an engineering contract including arbitration procedures in compliance with FIDIC construction documents. The presentation was well taken and appreciated by all attendees.

The upcoming annual convention and seminar has been planned to be held on 20th May, 2017 in King Salman Social Center, Riyadh.

IEP-SAC Annual Journal:

At the occasion of its annual convention including dinner, exhibition and technical seminar # 45 held on 14th May, 2016, IEP-SAC also published its annual journal as per the tradition, which comprised various technical papers, articles, reports, messages and the updated directory of Pakistani engineers working in KSA. This journal used to enhance the professional writing skills of the Pakistani engineers, promote the advancements in technical knowledge and share valuable information among engineers and engineering organizations. The hard work of publication committee made it possible to bring the annual journal 2016-17 into your hands at last annual convention with high quality and standards. The contents of last year annual journal were highly appreciated by the Pakistani engineers and other engineering organizations in KSA. I am confident that you will equally appreciate the new IEP-SAC annual journal for 2017-18 as well, which will be in your hands InshaAllah at the end of the upcoming annual convention planned on 20th May, 2016. Thanks to the Publication committee and its convener for their valuable contribution in this regard.

Scholarships Program:

In continuation to IEP-SAC practice since 1996, Alhamd-o-lillah we continued our scholarships program, which provides financial support to the needy, meritorious and deserving engineering students in Pakistan. This year, we have increased eight (8) scholarships to Khawaja Fareed University of Engineering and Information technology, Rahim Yar Khan; which increased to a total of 96 scholarships in twelve (12) public sector engineering universities / colleges throughout Pakistan and Azad Kashmir. This could have been possible only by the help of Allah and the financial contributions from various organizations, individual philanthropists and local council members. The appreciation goes to our Scholarships committee who had been striving hard throughout the year with full devotion and dedication to manage the timely dispersion of the scholarships to the students in Pakistan. I urge the readers of these lines to come forward a step ahead and contribute towards this noble and just cause. A detailed report of the scholarship committee has also been included in this journal.

Family Picnic:

Our famous social event, the family picnic was organized this year as well on 10th Feb, 2017 in an isteraha near Muzahimiyah. The picnic was attended by approximately 300 guests including men, women and children belonging to the families of Pakistani engineers in Riyadh. Various indoor and outdoor games for children and adults including table tennis, carom, races, cricket, quiz, poetry and raffle draw were the points of attraction for the guests at gents side. The ladies ad hoc committee also managed various games in ladies section for the girls and women, which were also enjoyed and praised by the families. Food was excellent both in quantity and quality. The planning and hard work of the IEP-SAC events management committee to organize this event restlessly and the brotherly support from all council members at the occasion made this picnic a successful event. Every participant realized that such social events provide time for interaction among engineering community in a relaxing and entertaining environment.

IEP-SAC Sub-Centres:

IEP-SAC Sub-centers in Eastern and Western regions have been very active in organizing various seminars and other social events. Detailed reports about the activities of the sub-centers from their chairmen with photographs are also included in the subsequent pages of this annual journal.

Appreciation And Gratitudes:

IEP-SAC expresses its gratitude to the Custodian of the Two Holy Mosques, H. M. King Salman Bin Abdul Aziz Al-Saud and the Government of the Kingdom of Saudi Arabia for providing opportunities to Pakistanis in general and Pakistani engineering community in particular to contribute towards the development of our brotherly country Saudi Arabia. We are also thankful to the patronage and support of the Ambassador of Pakistan and senior staff of Pakistan Embassy in Riyadh throughout the year. The contribution of IEP-SAC sub-center of Eastern region (Engr. Rizwan Ahmed and his local council members) in raising the funds for our scholarship program is highly appreciated and I urge our Western region sub-center also to participate in this noble and just cause. I wish to extend my thanks to all brother engineers, sponsors, advertisers, press/media personnel and well-wishers for their cooperation and continuous support to IEP-SAC.

Finally I wish to convey my deep appreciation to our chairman Engr. Mubashir Hussain Kirmani and all local council members of the central region for their guidance, support and untiring efforts without which IEP-SAC could not achieve the present height of success.

Thank you very much Thank you very much

Engr. S. M. Iqbal Ahmed
General Secretary IEP-SAC

From The FEIIC Advisor



I am pleased to learn that the IEP-SAC, is bringing out its annual magazine, The JOURNAL. The previous issues were hailed by the fellow engineers for its format as well as the contents. I am confident that this issue will be yet another milestone in the Editorial Board's pursuit of excellence.

While, however, technical and artistic excellences are very desirable and necessary, there are other elements required in a publication of The JOURNAL in order to fulfill its object completely. Of these other elements one, and perhaps the most important, is that our Magazine should convey a direct—a human—interest to as many individual members of the community as possible. There is a social as well as a business side to our relations with each other, and the cultivation of the human touch adds to the happiness and contentment of members who are engaged in the performance of their multifarious duties. The section on the light of Islam in The JOURNAL furnishes an outlet for items of this nature. I congratulate the Editorial Board for presenting and promoting this idea and hope that our other regions will follow suit.

All regions of IEP-SAC have gone extra length to extend their helping hand not only to the victims of such calamities as the 2005 earthquake and 2010 floods but also enlarging on a continuing basis an impressive scholarship program for needy engineering student of Pakistani engineering universities in the public sector. Our steps may be small but they are giant leaps under the light of Islam.

The volunteer services of the council members at the three regions—Central, Eastern, and Western—is the vehicle for making this success a possibility. Without their sheer hard work and dedication, our programs on the technical and social fronts could not have been held so successfully, and as always. I salute them all.

I call upon the community to come forward and contribute to the objects and purposes of the IEP-SAC and join hands with the Saudi Council of Engineers who has now more than 5300 Pakistani engineers registered with them. The cooperation of IEP-SAC and SCE will ensure ever growing strong relationship between PAKISTAN and SAUDI ARABIA.

Engr S M Jaleel Hasan

Advisor

Federation Of Engineering Institutions Of Islamic Countries (FEIIC)



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AWARDS AND SCHOLARSHIPS COMMITTEE

لَيْسَ الْبِرَّ أَنْ تُوْتُوا وُجُوْهَكُمْ قَبْلَ الْمَشْرِقِ وَالْمَغْرِبِ وَلَكِنَّ الْبِرَّ مَنْ آمَنَ بِاللّٰهِ وَالْيَوْمِ الْآخِرِ وَالْمَلَائِكَةِ وَالْكِتٰبِ وَ
الرّٰسُوْلِيْنَ ؕ وَآتَى الْمَالَ عَلَى حُبِّهِ ذَوِي الْقُرْبٰى وَالْيَتٰمٰى وَالْمَسْكِيْنَ وَابْنَ السَّبِيْلِ ؕ وَالسَّآئِلِيْنَ وَفِي الرِّقَابِ ؕ ۞

اِنْ تُبْدُوْا الصَّدَقٰتِ فَنِعَبَّا هِيَ ؕ وَاِنْ تَخْفُوْهَا وَتُوْتُوْهَا الْفُقَرٰآءَ فَهِيَ خَيْرٌ لَّكُمْ ؕ وَيُكَفِّرُ عَنْكُمْ مِّنْ سَيِّئٰتِكُمْ ؕ وَاللّٰهُ
بِمَا تَعْمَلُوْنَ خَبِيْرٌ ۞

“But Al-Birr (righteousness, piety) is the quality of one who believes in Allah, and the Last Day, and the Angels, and the Book, and the Prophets and distributes his wealth, in spite of love for it, to the kinsfolk, and to the orphans, and to the needy, and to the wayfarer, and to those who ask, and to the ransom of prisoners.” (Al-Baqarah-177)

“If you disclose your (acts of) charity, it is well, but if you conceal it, and give it those (really) in need, that is better for you; it will remove from you some of your (stains of) sins and Allah is well acquainted with what you do.” (Al-Baqarah-271)

By the grace of Allah the Almighty, the IEP-SAC scholarship program for needy and academically sound students in the Engineering Universities and Colleges of Pakistan was launched 21 years ago in the year 1996. With the joint efforts of IEP-SAC Local Council members, it has been expanding ever since and presently a number of students from the listed below 11 public-sector universities and colleges are being benefited from this program.

1. University of Engineering and Technology, Lahore
2. University of Engineering and Technology, Taxila
3. University College of Engineering and Technology (Baha'uddin Zakariya University) Multan
4. Institute of Chemical Engineering and Technology (University of the Punjab), Lahore
5. Dawood College of Engineering and Technology, Karachi
6. NED University of Engineering and Technology, Karachi
7. Mehran University of Engineering and Technology, Jamshoro
8. Quaid-e-Awam University of Engineering Sciences and Technology, Nawabshah
9. NWFP University of Engineering and Technology, Peshawar
10. Balochistan University of Engineering and Technology, Khuzdar
11. Mirpur University of Science and Technology (Must), Mirpur (AJ&K)
12. Khawja Fareed University of Engineering and Information Technology, Rahim Yar Khan

As can be noted from the list, this scholarship program serves all the four provinces of the Islamic Republic of Pakistan and the State of Azad Jammu and Kashmir. The rules and regulations, selection criteria and application forms can be accessed and printed from IEP-SAC website. By the blessings of Allah the Almighty, 19 batches of the scholarships have been completed so far and 20th batch will be launched in September 2017, benefiting meritorious and needy students from this scholarship program who will serve the humanity and our homeland after graduation.

The continuity of IEP-SAC scholarship program has not only been maintained during last 21 years, but it has also been expanding gradually with the help of financial contributions from various philanthropists, individuals, and organizations in Saudi Arabia. I take the opportunity to offer the readers of these lines in general and the Pakistani community and engineers in particular to join hands with us in this noble and just cause. It is a great service to the humanity Engineering community in Pakistan. Let us put our maximum efforts in contributing and expanding the scholarship program to the needy engineering students.

Your suggestions to improve the program further will be most welcomed. Please do not hesitate to contact any of the members of IEP-SAC Awards and Scholarships Committee or Local Council for any suggestion or information.

Engr Shaikh Akhtar Hussain, Convener
IEP-SAC Awards and Scholarships Committee





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يَا أَيُّهَا النَّاسُ إِنَّا خَلَقْنَاكُمْ مِنْ ذَكَرٍ وَأُنْثَىٰ وَجَعَلْنَاكُمْ شُعُوبًا وَقَبَائِلَ لِتَعَارَفُوا إِنَّ أَكْرَمَكُمْ عِنْدَ اللَّهِ أَتْقَاكُمْ إِنَّ اللَّهَ عَلِيمٌ خَبِيرٌ (١٣) الحجرات

O mankind, indeed We have created you from male and female and made you peoples and tribes that you may know one another. Indeed, the most noble of you in the sight of Allah is the most righteous of you. Indeed, Allah is Knowing and Acquainted. (Al Hujraat)

IEP-SAC Standing Committees 2017

Central Region

Scholarships Committee

Engr. Sh. Akhtar Hussain (Convener)
Engr. Dr. Nazar H. Malik (Co-Convener)
Arch. Farooq Iqbal (Member)
Engr. Imran Zaheer (Member)

Finance Committee

Engr. Riaz Ahmed (Convener)
Engr. Ghulam Safdar (Co-Convener)
Engr. Syed Jaleel Hasan (Member)

Liaison Committee

Engr. Syed Jaleel Hasan (Convener)
Engr. Ghulam Safdar (Co-Convener)
Engr. S. A. Majeed Shah (Member)

Publication Committee

Engr. Naveed Ahmed (Convener)
Engr. M. Asim Siddiqui (Co-Convener)
Engr. Tahseen Ahmed Qazi (Member)

Technical Seminar Committee

Engr. Sh. Asrar Ahmed (Convener)
Arch. Farooq Iqbal (Co-Convener)
Engr Mian Abdul Hamid (Member)
Engr. M. Sajid Mushtaque (Member)

IT and Media Committee

Engr. M. Asim Siddiqui (Convener)
Engr. Dr. Awais Mahmood (Co-Convener)

Events Mangement Committee

Engr. Dr. Awais Mahmood (Convener)
Engr. Farhan Sohail Yazdani (Co-Convener)
Engr. Imran Zaheer (Member)
Engr. Riaz Ahmed (Member)
Arch. Farooq Iqbal (Member)
Engr. Sajid Mushtaque (Members)

Sponsorship and Advertisement Committee

Engr. S. A. Majeed Shah (Convener)
Engr. Shaikh Asrar Ahmed (Co-Convener)
Engr. Naveed Ahmed (Member)
Engr. M. Sajid Mushtaque (Member)
Arch. Farooq Iqbal (Member)
Engr. Rizwan Ahmed(EP) (Member)

Special Sub Committees

Advisory Sub Committee

Engr. Dr. Nazar H. Malik (Convener)

Bye-Laws Review Sub Committee

Engr. Ghulam Safdar (Convener)
Engr. Dr. Awais Mahmood (Co-Convener)
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S

CENES FROM IEP-SAC Activities

CENTRAL REGION

45th IEP-SAC Annual Technical Seminar, on 14th May 2016
at King Salman Social Centre Riyadh



S

CENES FROM IEP-SAC Activities

CENTRAL REGION

45th IEP-SAC Annual Technical Seminar, on 14th May 2016
at King Salman Social Centre Riyadh



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CENES FROM IEP-SAC Activities

CENTRAL REGION

46th IEP-SAC Annual Technical Seminar, 18th November 2016
at Marhaba Banquet Hall Riyadh



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CENES FROM IEP-SAC Activities

CENTRAL REGION

46th IEP-SAC Annual Technical Seminar, 18th November 2016
at Marhaba Banquet Hall Riyadh





SCENES FROM IEP-SAC Activities

CENTRAL REGION

Family Picnic, 10th February 2017, Istraha AMASI





CENES FROM IEP-SAC **Activities**

CENTRAL REGION

Family Picnic, 10th February 2017, Istraha AMASI



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CENES FROM IEP-SAC Activities

CENTRAL REGION

An event "Thanks to Sponsors" hosted by IEP-SAC at Riyadh Palace Hotel on 12 April 2017 in the appreciation of sponsors for their valuable contribution to the cause of IEP.



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From The Eastern Region

Vision is the power of imagination to foresee and analyze resources. Vision allows us to shape up the future for the benefit of the nation.

The prime responsibility of the leader is to explicitly define the vision of the nation. The leader must bring precise ideas into reality with a positive attitude and effective systems. These plans must be implemented by a qualified team fostering a culture conducive to achieve excellence.

A true leader is a source of inspiration and encouragement for young leaders.

Essential knowledge is only institutionalized by sharing together and implementing ideas with determination. It is necessary that a responsible leader rewards all concerned reasonably for the best utilization of human resources to optimizer their efficiency.

Quaid-e-Azam was a visionary leader, founder of a great nation, emphasized on sharing engineering knowledge. Following his vision, IEP-SAC-EP organized four technical seminars besides other activities.

1. Essentials to Achieve Success in Personal & Professional Life by Engr. Waseem Ijaz, CEO Intl. Paint Co.
2. Enterprise Risk Management by Engr. Tariq bin Zafar; General Manager, M. A. Al-Azzaz Inspection & Testing Services.
3. Green Building Movement by Engr. Misbah ul Islam Sabri; MEP Manager with Arab Technology.
4. Supplementary Cementitious Materials (SCMS) by Engr. Redwan Amin Hameed; Research and Development Director at Saudi Readymix Concrete Company.

On behalf of IEP-SAC-EP, I would like to thank Custodian of Two Holy Mosques for his visionary leadership and continued support for engineering community as well.

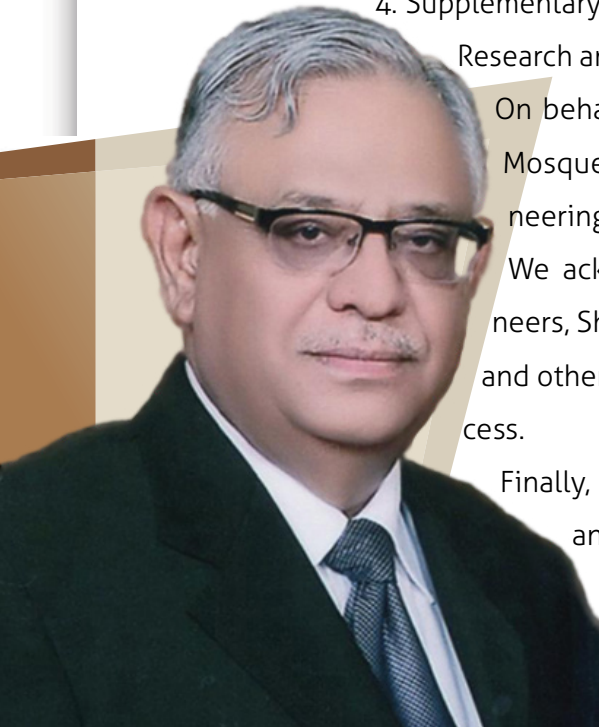
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Finally, Thanking Almighty ALLAH for providing us resources, energy and opportunities to serve our communities.

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قَالَ رَسُولُ اللَّهِ صَلَّى اللَّهُ عَلَيْهِ وَسَلَّمَ لِيَسْأَلْ أَحَدُكُمْ رَبَّهُ حَاجَتَهُ كُلَّهَا
حَتَّى يَسْأَلَ شِسْعَ نَعْلِهِ إِذَا انْقَطَعَ

Allah's Messenger (SAW) said, "Let everyone of you ask his Lord for all his needs-asking also for the thong of his sandal when it is damaged."

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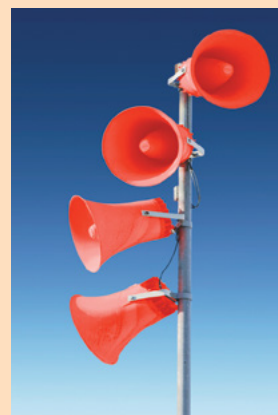
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Environmental Pollution, Causes, Effects and Control

by

S.M.H. Kirmani

Abstract

Environmental pollution is the contamination of the physical and biological components of the Earth and atmosphere system to such an extent that the normal environmental process is adversely effected. Since the start of the industrial revolution vast amount of natural resources have been exploited within a period of just a couple of hundred years at unimaginable rates, with all the waste from the exploitation going straight into the environment (AIR, WATER, LAND) and seriously damaging its natural processes.

In this Article, author has discussed the various causes and effects of the environmental pollution and suggested various steps to control or mitigate their effects. These points emphasize that pollutants present a serious long term global problem that affects more or less every country and, therefore, needs a coordinated set of actions and unwavering commitment of nations to international environmental

Introduction:

Pollution is the introduction of contaminations into the environment that cause damage to environment and harm or discomfort to humans or other living species. In one word, environment pollution takes place when the environment cannot process and neutralize harmful byproducts of human activities in due course without any structural or functional damage to its system.

Environmental pollution is a problem both in developed and developing countries. Factors such as population growth, urbanization invariably place greater demands on the planet and stretch the use of natural resources to the maximum.

Environmental pollution had been a fact of life for many centuries but it became a real problem since the start of industrial revolution during 19th. Century. Environmental pollution is the contamination of physical and biological components of the earth and atmosphere system to such an extent that the normal environmental process is adversely effected.

Broadly, environmental pollution consists of six types of pollution, i.e. AIR, WATER, LAND, SOIL, NOISE and Light. Things as simple as light, sound, and temperature can be considered pollutant when introduced artificially into an atmosphere.

Three general characteristics of environmental pollution are identified. (1)

- Pollutants don't recognize boundaries, i.e. they are transboundary.
- Many of them cannot be degraded by living organism and therefore stay in the ecosphere for many years,
- They destroy biota and habitat (2)

Source of environmental pollution

In the modern industrialized societies there is no reasonable doubt the fossil fuels are among the

most serious source of environmental pollution. Power generating plants and transport are probably the biggest source of fossil fuel pollution.

Fossil fuel combustion is also a major source of Carbon dioxide (CO₂) emission and perhaps the most important cause of global warming.

- Among other pollution sources, agriculture (Live stock forming) is worth mentioning as the largest generator of ammonia emission resulting in air pollution.
- Chemicals such as pesticides and fertilizers are also widely used in agriculture. Which may lead water pollution and Soil contamination.
- Residential sector is another significant source of pollution generating solid municipal waste that may end up in landfills or incinerators leading to contamination and air pollution.
- Deforestation is hampering level of fresh oxygen in air and causing more carbon dioxide in environment.
- Trading activities like packaging of products sold in super market and other retail outlets generate large quantities of solid waste that ends up either in landfills or municipal incinerators leading to contamination and air pollution

1) Air Pollution :

Air pollution is one of the largest areas of environmental pollution which needs our serious attention. Air lets our living planet breathe. 99 percent of it is made up of Nitrogen, Oxygen, Water vapor and inert gases. Air pollution occurs when the quantity or concentration of carbon dioxide changes from "harmless" to "pollution". Carbon dioxide as a typical concentration in air is less than 0.05 percent and breathing it usually does no harm, but air with an extremely high concentration of CO₂ (say 5-10 %) is toxic and could kill you.

Natural and Human caused air Pollution :

Normally it is believed that air pollution is a problem that humans cause through ignorance or negligence. However, it is a fact that some kind of air pollution are produced naturally. Forest fires, erupting volcanoes and gases released from radioactive decay of rocks inside Earth are just three examples of natural air pollution that can have hugely disruptive effects on people and the planet.

In this Article we will consider only "Unnatural" types of pollution, the problem that people cause

and which we can control or mitigate.

Top Ten Gases In Air Pollution:

Theoretically there are dozens of different pollution gases, however in practice, about ten different substances cause most concern. They are as following:

- i) Sulfur dioxide: Coal fired Power plants are the world's major source of Sulfur dioxide (SO₂) in pollution, which contributes SMOG (A combination of the word smoke and fog), acid rain, and health problem that include Lung disease.
- ii) Carbon mono oxide: This is highly dangerous gas which is formed when fuels have too little Oxygen to burn completely. It's source is normally car exhausts, poorly maintained gas boilers, stove or fuel-burning appliances,
- iii) Carbon dioxide: This gas is central to every day life. We all produce it when we breath out and plants and trees need to "breath" it in to grow. However, CO₂ is also a "GREEN HOUSE GAS" released by engines and power plants. Since the beginning of industrial revolution, it is being building up in Earth's atmosphere and contributing to the problem of Global Warming and Climate change. Clear cutting of forests has exacerbated this problem so natural defenses are no longer present and CO₂ level are on the rise.
- iv) Nitrogen Oxide: Nitrogen dioxide (NO₂) and Nitrogen oxide (NO) are pollutants produced as an indirect result of combustion, when nitrogen and oxygen from the air react to gather. Nitrogen oxide pollution comes from "Vehicle engines" and power plants, and plays an important role in the formation of "acid rain", "Ozone" and "Smog".
- v) Volatile Organic Compounds (VOCs): These carbon-based (organic) chemicals evaporate easily at ordinary temperature and pressure, so they readily become gases. They are used as solvent in many building materials such as "Paints", "Waxes" and "Varnishes". Unfortunately, they are also a form of air pollution. They are believed to have long-term (Chronic) effects on people's health and they also play role in the formation of Ozone and Smog.
- vi) Particulate matters (PM): Particulate matter are also called particulate pollution. The term is used for a mixture of solid particles and liquid droplets found in air. Particulate pollution include:
 - PM₁₀ – Inhalable particles with diameters that are generally 10 micrometers or

smaller.

- PM_{2.5} – Fine inhalable particles with diameter that are generally 2.5 micrometers or smaller.

In cities, most particulates come from traffic fumes.

vii) OZONE:

Also called tri oxygen (O₃). In the atmosphere (upper atmosphere), a band of Ozone (The Ozone layer) protects us by screening out harmful ultra violet radiation beaming down from the Sun. At ground level, it is a toxic pollution that can damage health. Also it is a key ingredient of "SMOG".

It forms when sunlight strikes a cocktail of other pollutant gases such as nitrogen and Sulfur oxides, unburned hydrocarbons and carbon mono oxide. That is why it is some times called photochemical smog (The energy in light causes the chemical reaction that makes "SMOG"). One of the most harmful constituent of smog is a toxic form of oxygen called Ozone, which can cause serious breathing difficulties and even, some times death.

viii) Chlorofluorocarbons (CFCs):

These gases which were used in Refrigerators and Aerosol cans were initially thought harmless until it was discovered that they damage Earth's Ozone layer.

ix) Unburned Hydrocarbons:

Petroleum and other fuels are made of organic compounds based on chains of Carbon and Hydrogen atoms. When they burn properly, they are completely converted into harmless Carbon di oxide and water. When they burn incompletely, they can release Carbon mono oxide or float into the air in their burned form, contributing to "Smog".

x) Leads and Heavy metals:

Lead and other toxic "Heavy metals" can be spread into the air either as toxic compounds or as aerosols (When solids or liquids are dispersed through gases and carried through the air by them) in such things as exhaust fumes and "Fly ash" from incinerator smoke stacks.

Air quality guidelines and their rationale:

The World Health Organization (WHO) has suggested the guidelines of air quality (Air pollution limit) in respect of air borne particulate matter (MP); Ozone (O₃); NO₂ and SO₂ and in each case give the rationale for the decision to revise the guidelines value or retain the existing value.

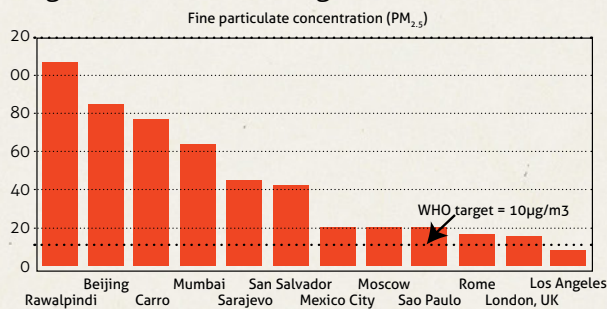
WHO Air Quality Guidelines

Pollutants	Guidelines
1) Particulate matter (PM)	10 micro gram/cu.m ; annual mean.
PM 2.5 (see note # 1)	25 micro gram/cu.m ;24-hour mean
PM 10	20 microgram/cu.m, annual mean.
	50 microgram/cu.m 24-hour mean.
2) OZONE (O3)	100 microgram/cu.m ; 8-hour mean
3) Nitrogen Dioxide(NO2)	40 microgram/cu.m; annual mean
	200 microgram/cu.m; 1-hour mean
4) Sulphur Dioxide (SO2)	20 microgram/cu.m; 24 hr.mean
	500 microgram/cu.m 10-hr. mean

(Note # 1 : PM2.5 : Fine inhalable particles, with diameter that are generally 2.5 micrometers or smaller)

World Health Organization (WHO) ambient air pollution in cities data base 2016 :

The following chart compares annual mean PM2.5 levels in 12 representative cities around the world with the WHO guideline value 10 microgram/cu,meter (dotted line). Most of the world's major cities routinely exceed WHO air pollution guide line.PM2.5 concentration in RAWALPINDI,Pakistan is the highest (105 microgram/cu.meter as compared to WHO target of 10 microgram/cu.meter) among all cities.



Word Health Organization (WHO) Ambient (outdoor) air pollution in cities database 2016

WHO Ambient Air Pollution in Various Cities of the World.

WHO measured Air pollution of various countries in world:

The Table implies that countries like Pakistan, India, Bangladesh,Saudi Arabia,UAE, Iran, Kuwait and Egypt have PM10 concentration more than 100 microgram/cu.meter. Pakistan is on the top of the list having 198 microgram/cu.meter against WHO average value of 71 microgram/cu.meter.

According to World Bank report published in daily DAWN of July 14,2004;" Pakistan's Urban air pollution is among the most sever in the world and it engenders significant damage to human health and economy."

The report calls upon the government to make Urban air quality improvement a priority in the country's policy agenda ,noting that the issue has received little attention despite strong evidence indicating an urgent need to tackle pollution in major cities.

In this context the proposed Coal burnt power plant in Karachi would further deteriorate the air pollution issue.

Table # 1: World Pollution Chart

Country	Annual mean PM 10 micro gram/cu.m	Above or below world ave. of WHO 71 microgram/ cu.m
1.Australia	13	-58
2. Bangladesh	120	49
3. Belgium	26	-45
4.Brazil	40	-31
5.Canada	13	-58
6.China	98	27
7.Denmark	27	-44
8. Egypt	138	67
9.France	27	-44
10.Germany	25	-46
11.India	109	38
12.Indonesia	55	-16
13.Italy	37	-34
14.Japan	22	-49
15. Kuwait	123	52
16 Malaysia	42	-29
17. Netherland	26	-45
18.Newzeland	22	-49
19.Nigeria	124	53
20.Pakistan	198	127
21.Philippines	47	-24
22. Republic of Korea	61	-10
23. Russian Federation	32.5	-38
24. Saudi Arabia	143	72
25 Singapore	32	-39
26. Spain	29	-42
27. South Africa	52	-19
28. Sri Lanka	77	6
29. Sweden	25	-46
30. Switzerland	22	-49
31Turkey	66	-5
32. UAE	132	61
33.United Kingdom	23	-48
34. United state of America	18	-53
35.Iran	124	53

2) Water Pollution

Water pollution takes place when chemicals or dangerous water substances are introduced to water. Main sources of water pollution are:

- i) Sewage and waste water.
- ii) Industrial and agricultural waste (Volatile organic compounds(VOCs),heavy metals,Pesticides,insecticides,fertilizer and agricultural runoff)
- iii) Oil Pollution.
- iv) Atmospheric Deposition
- v) Marine Dumping
- vi) Radio active waste
- vii) Global warming
- viii) Eutrophication
- ix) Under ground Storage leakage.

Major pollutants include organic matter and disease causing organism from sewage and waste water discharges , fertilizers and pesticides running from agricultural lands, acid rains resulting from air pollution and heavy metals released by mining and industrial activities. The expansion of industry to the developing world , in addition to local human contamination of fresh water supplies, is making it more difficult to maintain water quality(3).

- According to the united nations report,783 million people do not have access to clean water and around 2.5 billion do not have access to adequate sanitation .Adequate sanitation helps to keep sewage and other contamination from entering the water supply.
- According to National Oceanic and Atmospheric Administration(NOAA), 80 percent of pollution in marine environment comes from the land through sources such as runoff. Water pollution can severely affect marine life. For example, sewage causes pathogens to grow, while organic and inorganic compounds in water can change the composition of the precious resources.
- According to Environmental protection Agency (EPA), low levels of dissolved oxygen in the water are also considered a pollution. Dissolved oxygen is caused by the decomposition of organic materials, such as sewage introduction in the water.
- More than 80 % of sewage in the developing countries is discharged untreated, polluting Rivers, Lakes and Coastal areas.
- Globally, the most prevalent water quality problem is eutrophication ,a result of high-nutrient load (Mainly Phosphorus & Nitrogen) which substantially impairs beneficial use of water (3). This can be a problem in marine habitats such as it can cause " Algal

blooms"

- Oil spills make about 12 % of the oil that enters the Ocean. Oil cannot dissolve in water and form a thick sludge in the water. It blocks light from photosynthetic aquatic plants. Besides, it is harmful to marine habitats.
- Nuclear waste is produced from industrial, medical and scientific process that use radioactive materials. Nuclear waste can have detrimental affects on marine habitats.

3) Land & Soil Pollution

Land pollution means degradation or destruction of earth's surface and soil caused by natural factors or human activities.

Natural factors include volcanic eruption ,changes in rain fall pattern, earth quakes , topographic changes, wind and glacier movements.

Human activities responsible for Land pollution are:

- Deforestation and Soil erosion.
- Agricultural activities.
- Mining activities.
- Over crowded landfill (House hold garbage & industrial waste)
- Industrialization.
- Sewage Treatment.
- Nuclear waste .

Soil pollution is another form of Land pollution, where upper layer of the soil is damaged. This is caused by over use of chemical fertilizers, Soil erosion caused by running water.

Pest control measures lead to loss of fertile land for agriculture, forest cover, folder patches for grazing etc. and change in climate pattern. The effect of Land pollution are very hazardous and can lead to the loss of ecosystem. When land is polluted, it directly or indirectly affects the climate pattern.

4) Noise Pollution:

Noise pollution happens when the sound coming from planes, industry or other sources reach harmful level. Causes of noise pollution are:

- i) Industrialization
- ii) Poor urban planning
- iii) Social events
- iv) Transportation
- v) Construction activities
- vi) House hold chores

Research has shown direct links between noise and health including stress-related illness, high blood pressure, speech interference and hearing loss. A study by WHO Noise Environmental Burden on Health working group found that noise pollution may contribute to hundreds of thousands of deaths per year by increasing the rates of coronary heart

disease.

Harmful Noise Level:

According to WebMD Magazine sound above 85dB are harmful. Average decibels(dB) of some noise are as under:

	Noise	Average dB
1	Soft music,Whisper	30
2	Ave.home noise	40
3	Normal conversation	60
4	Office noise	70
5	Vacuum cleaner	75
6	Heavy traffic>window A/C	80-89 (Above harmful level)
7	Subways,Shouted conversation	90-95
8	Boom box,ATV,Motor Cycle	96-100
9	Leaf blower,Snow mobile	106-115
10	Stock car race	130
11	Gun shot,Siren at 100 ft.	140

Prevention And Control:

It is widely recognized that we are hugely over-spending our current budget of natural resources, at the existing rate of exploitation. The trans boundary nature of environmental pollution makes it even more difficult to manage it. Every thing on our planet is "interconnected ",and while the nature supplies us with valuable environmental services without which we can not exist, we all depend on each other's action and the way we treat natural resources. However, on natural basis a priority should be given in the country's policy agenda for prevention, improvement and control the Enviornmental pollution especially for air and water quality improvement.

Emphasis should be given to the following issues:

1. Curtail fossil fuel power generation and switch over to Solar Power .Wind Power and Hydraulic Power generation.
2. Minimization of environmental health impacts.
3. Improving the efficiency of motorized vehicles and transportation.
4. Stop deforestation.
5. Control urbanization .
6. To make mandatory Sewage Treatment and disposal of Urban solid waste.
7. Industrial waste water treatment.
8. Adopt green agricultural practices.
9. National legislation for anti-pollution laws and polices.

10. Individual efforts and educative campaign
11. According to the recommendations of UNEP (United nations Environmental Program) and WHO, water supply and sanitation council, strategic approach should be as following:

11.1) Prevent pollution rather than treating symptoms of pollution.

11.2) Use the precautionary principles.

11.3) Apply water pollution control to the lowest appropriate levels.

11.4) Apply realistic standards and principles.

11.5) Encourage participating approach with involvement of all relevant Stack holders.

12. World Bank (WB) calls for a series of coordinated intervention to strengthen monitoring, build institutional capacity, strengthen the regularity frame work and fill the existing knowledge gap.

Conclusion:

Environmental pollution is one of the greatest challenges that world is facing today. It began since industrial revolution, increasing day by day and causing irreparable damage to our planet. Environmental pollution has its own causes, effects and solutions .Looking into these will help you identify the causes and what steps you can take to mitigate those effects.

Air and water pollution are among the major challenges in the world that engenders significant damage to human health and economy.

According to WHO ambient air pollution in cities data base 2016, Rawalpindi (Pakistan) is the most air polluted city in the world, where as Pakistan tops among the top 10 countries having PM10 concentration more than 100 microgram per cubic meter(In Pakistan it is 198 microgram per cubic meter.) against WHO average value of 71 microgram per cubic meter.

World Bank report(2014) calls upon the government of Pakistan to make urban air quality improvement a priority in the country's policy agenda ,noting that the issue has received little attention despite strong evidence indicating an urgent need to tackle pollution in major cities. The intended installation of Coal fired Power generation plant in Karachi would aggravate the air pollution and would further cause damage to the health and ecology of the area.

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About Author



Engr. Syed Mubashir Hussain Kirmani (smhkirmani@hotmail.com) is a civil engineer with over 48 years of experience in Soil and foundation engineering, structural design, Public health engineering, water and waster water engineering and environmental Engineering:

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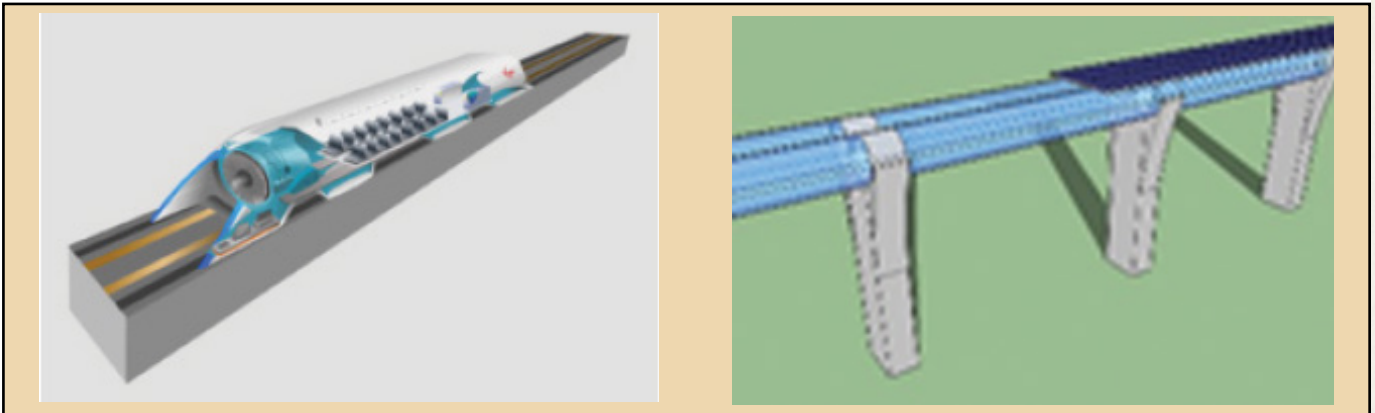
Physics with Astronomy and environmental studies in 1963 from University of Karachi, B.Eng. from NED Eng. College, Karachi in 1967, PGD in Engineering Management from Institute of Business Administration (IBA) Karachi in 1971. Engr. Kirmani has post graduate studies in diversified subjects of Civil engineering and environmental engineering.

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Hyperloop

Hyperloop is a proposed mode of passenger and freight transportation that would propel a pod-like vehicle through a reduced-pressure tube that would exceed airliner speed. The alpha version of the proposal, published on the SpaceX website, describes design claims of the system, as well as its function. The pods would accelerate to cruising speed gradually using a linear electric motor and glide above their track using passive magnetic levitation or air bearings. The tubes could also go above ground on columns or underground, eliminating the dangers of grade crossings. It is hoped that the system will be highly energy-efficient, quiet and autonomous.



The concept, created by Elon Musk in 2012, incorporates reduced-pressure tubes in which pressurized capsules ride on an air cushion driven by linear induction motors and air compressors.

The outline of the original Hyperloop concept was made public by the release of a preliminary design document in August 2013, which included a suggested route running from the Los Angeles region to the San Francisco Bay Area, paralleling the Interstate 5 corridor for most of its length. Preliminary analysis indicated that such a route might obtain an expected journey time of 35 minutes, meaning that passengers would traverse the 350-mile (560 km) route at an average speed of around 600 mph (970 km/h), with a top speed of 760 mph (1,200 km/h), which is a great improvement compared to the current travel time of about six hours. Preliminary cost estimates for the LA-SF suggested route were included in the white paper—US\$6 billion for a passenger-only version, and US\$7.5 billion for a somewhat larger-diameter version transporting passengers and vehicles - although transportation analysts had doubts that the system could be constructed on that budget; some analysts claimed that the Hyperloop would be several billion dollars overbudget due to construction, development and operation costs.

The Hyperloop concept has been explicitly open-sourced by Musk and SpaceX, and others have been encouraged to take the ideas and further develop them.

To that end, a few companies have been formed, and several interdisciplinary student-led teams are working to advance the technology. SpaceX is building an approximately 1-mile-long (1.6 km) subscale track for its pod design competition at its headquarters in Hawthorne, California.

Most experts are skeptical, saying that the proposals ignore the expenses and risks of developing the technology and that the idea is “completely impractical”. Claims have also been made that the Hyperloop is too susceptible to disruption from a power outage or terror attacks to be considered safe.

Selective Handover Reduction for LTE Femtocells

By

Engr. Mohammad Asim Siddiqui

Abstract

The increasing demands of high speed data applications necessitate the evolution of wireless networks to provide improved support with enhanced Quality of Service (QoS). IMT-advanced requires that future networks be able to support 10 Gbps downlink speeds with low mobility and 1 Gbps with high mobility. These networks must also support User Equipment (UE) mobility up to 500 km/h. Mass femtocell deployment is a solution that can provide high network capacity and improved indoor coverage. However, high mobility and mass deployment means a very large number of handovers among femtocells. Further, carrier aggregation in future networks makes handovers more challenging. In this paper, a technique is presented to reduce the number of femtocell to femtocell handovers by moving high mobility users to macrocells. Results are presented which show that the proposed approach not only reduces the number of handovers, and thus the network load, but also the cumulative downlink service interruption time during handovers.

I. Introduction:

The tremendous increase in real-time packet based applications has created significant service demands on the underlying networks. These applications require high data rates, very low latency and a minimal packet loss rate. Femtocells have the potential to support the exponential growth in data usage with high Quality of Service (QoS). A femtocell, referred to as a Home eNodeB (HeNB), is a low power wireless access point which supports the same functions as an eNB with a few exceptions [2]. The protocols between an HeNB and the core network are the same as between an eNB and the core network. The HeNBs are connected via an X2 interface so that X2 based handovers occur between them. Large clusters of HeNBs are expected to be deployed in public places such as malls, hospitals, college campuses, and office blocks. These HeNBs may be deployed without any network planning and may move from one geographical area to another [2]. A connected mode User Equipment (UE) moving quickly through a cluster of HeNBs will require numerous handovers, resulting in a degradation of UE services and an increase in the EUTRAN/MME control plane load. Thus an improved handover mechanism is required to reduce the number of handovers in both idle and connected modes.

Current mobile networks offer two main handover procedures, soft handover and hard handover. Soft handover means that the UE maintains wireless connectivity with the source eNB until the connection with the target eNB is established. Thus there is a phase in soft handover when the UE is connected

to both the source and target eNBs, which increases the burden on network resources. Hard handover, as the name implies, involves breaking the connection between the UE and source eNB before a connection is established with the target eNB. This requires fewer network resources, but there is always a time-out phase when the UE has no connectivity with any eNB.

LTE and LTE-advanced networks use hard handover to limit the network resources used during handover. Substantial research has been done on improving the performance of these networks during handover. Investigation of the X2 and S1 3GPP handover procedures indicates that the X2 interface is a better solution than the S1 interface for an inbound handover [5]. An S1 based handover requires 25% more signaling messages for intra-MME and intra-SGW handovers, and 43% more for intra-MME and inter-SGW handovers, as compared to X2 based handovers. A Fractional Soft Handover Scheme (FSHO) based on carrier aggregation was proposed in [7] to reduce the handover outage probability. During handover, VoIP services are transmitted from both the source eNodeB and target eNodeB, while non-VoIP services are transmitted by the source eNodeB or target eNodeB. This approach provides a low handover outage probability, and improves the reliability of VoIP services.

Hybrid handover, based on a combination of fractional soft handover and semisoft handover with multicarrier handover techniques, was proposed in [1] to enhance the performance in terms of latency, outage probability, interruption time and reliability during handovers, especially at cell boundaries. The later introduction of data bi-casting to both the source and target cells after initiation of the eNB-HeNB or reverse handover process was suggested in [8] to reduce the downlink service interruption time and packet loss. Minimal additional resources are required for this technique to limit packet loss. Mass HeNB deployment introduces scalability and security problems which can be addressed by the introduction of an intermediate node HeNB Gateway (HeNB GW) [6]. This acts as a mobility anchor to control handovers among femtocells, or as a relay between the HeNB and Evolved Packet Core (EPC).

It has also been shown [9] that a direct X2 interface based handover in the HeNB-HeNB case provides the best signaling overhead and deployment complexity tradeoff. Further, an X2-GW based solution is best for the eNB-HeNB case. A novel approach to reduce the number of femtocell to outdoor macrocell handovers was introduced in [10]. This is achieved using a modified Self-organizing Map (SOM) to determine the indoor locations where handover requests have occurred. Once the regions are identified where unnecessary requests have occurred, handover requests from these regions can be denied by the femtocells.

II. The Proposed Handover Technique

Since there will be a large number of femtocells within a macrocell area, a user moving quickly within a region will undergo many handovers. To avoid this situation, four new parameters are introduced: Monitoring Time (MT), HeNB-HeNB Handover Threshold (HHT), Number of Handovers during an MT (NoH), and Retention Time (RT). These parameters are defined as follows:

MT: A configurable time during which the number of HeNB-HeNB handovers is recorded [11].

HHT: Threshold for the number of HeNB-HeNB handovers.

NoH: Number of HeNB-HeNB handovers by the UE in connected mode during time MT. Once this time expires, the counter is reset to zero.

RT: The time the UE is held in the macrocell after handover from a femtocell.

The parameters MT, HHT and NoH are defined for femtocells while RT is defined for macrocells. When the user is in connected mode in a femtocell and undergoes a handover, the network will start monitoring the number of handovers (NoH). If NoH exceeds the threshold HHT within time MT, a femtocell to macrocell handover is invoked. This handover should be differentiated from a normal femtocell to macrocell handover. Depending on the macrocell load, it may or may not decide to accept the handover request. Once in the macrocell, the user will have far fewer handovers and thus less latency and control data exchanges with the network. This user can be offloaded to a femtocell after RT time using a standard macrocell to femtocell handover. This technique can be used in idle mode to further reduce the load on the control plane. The proposed approach keeps slow moving or stationary users in femtocells while fast

moving users are transferred to macrocells.

III. Key Performance Indicator Analysis

As an example, consider the following scenario with a user traversing a macrocell (Macrocell A) and 7 femtocells (Fem1 to Fem7), as shown in Fig. 1. The handover decision is made as described in [2]. Suppose the UE is moving at a random speed within Macrocell A and is offloaded to femtocell Fem1. Since the speed is random and each handover is independent of other handovers, these handovers can be considered a Poisson process with rate $\lambda = 5$ HeNB-HeNB handovers per minute. Let $MT = 1$ min, $HHT = 5$ and $RT = 1$ min. Starting at Fem1, the UE moves randomly to Fem2, Fem7, Fem6, Fem5, Fem4 and Fem3, as shown in the figure, within one minute. When the UE moves from Fem4 to Fem3, the HHT is exceeded and a UE handover to Macrocell A is initiated.

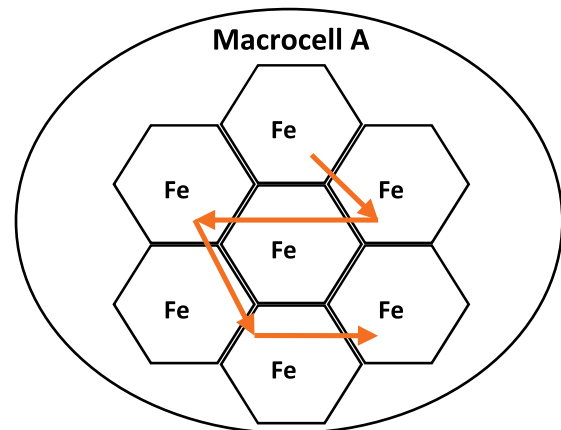


Fig. 1: The movement path for the test scenario

To ensure a fair comparison, we assume that eNB-HeNB and HeNB-eNB handovers are S1 based, while HeNB-HeNB handovers are X2 based via direct X2 interface. The S1 and X2 based handover procedures are shown in Figs. 2 and 3 [12].

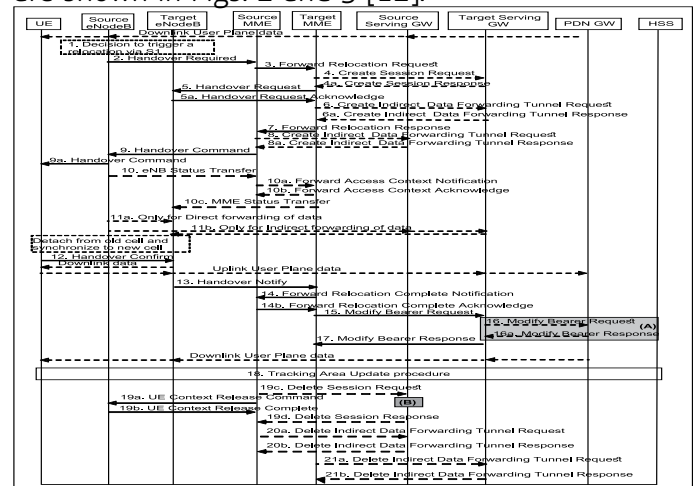


Fig. 2: The S1 based handover procedure.

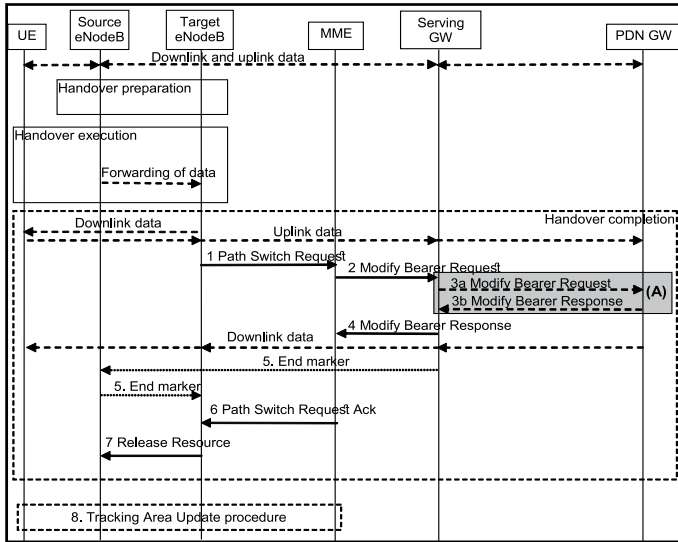


Fig. 3: The direct X2 based handover procedure.

The latencies between the network nodes are denoted by the following random variables:

$D_{eNB-MME}$: The latency between eNB and MME

$D_{eNB-SGW}$: The latency between eNB and SGW. Without loss of generality, we assume that $D_{eNB-MME}$ and $D_{eNB-SGW}$ have the same distribution denoted by x .

$D_{HeNB-MME}$: The latency between HeNB and MME.

$D_{HeNB-SGW}$: The latency between HeNB and SGW. Without loss of generality, we assume that $D_{HeNB-MME}$ and $D_{HeNB-SGW}$ have the same distribution represented by y .

D_{HO_exec} : The handover execution latency is from the time the UE receives the RRC Connection Reconfiguration message to the time the target cell receives the RRC Connection Reconfiguration Complete message as shown in Fig. 3. For simplicity, denote this value by h .

We assume that both x and y have mixed-Erlang density functions given by [3], [8]

$$f_z(t) = \sum_{j=1}^{N_z} \alpha_{z,j} \left[\frac{(\lambda_{z,j} t)^{m_{z,j}-1}}{m_{z,j}-1} \right] z_{j,j} e^{-\lambda_{z,j} t}$$

where $\sum_{j=1}^{N_z} \alpha_{z,j} = 1$, and Z can be either x , y or h . J and $\alpha_{z,j}$ determine the shape and scale of the distribution. The mixed-Erlang density function provides a good approximation for many other distributions as well as measured data. The Laplace transform of Z is

$$f_z^*(s) = \sum_{j=1}^{N_z} \alpha_{z,j} \left(\frac{\lambda_{z,j}}{s + \lambda_{z,j}} \right)^{m_{z,j}}$$

Let the data forwarding latency be $A = x + y$ and $B =$

$y + y$ for S1 and X2 based handovers, respectively. The Downlink Service Interruption Time (DL_SIT) is determined by the maximum value between A/B and h for the two cases, respectively. The expected value of DL_SIT for both S1 and X2 based handover can be expressed as

$$E[DL_SIT] = \int_{W=0}^{\infty} \int_{h=0}^W W f_h(h) f_W(W) dh dW + \int_{W=0}^{\infty} \int_{h=W}^{\infty} h f_h(h) f_W(W) dh dW$$

where W is either A or B depending on the handover interface. Then we have

$$E[DL_SIT] = \int_{W=0}^{\infty} W f_W(W) \int_{h=0}^W \sum_{j=1}^{N_h} \alpha_{h,j} \left[\frac{(\lambda_{h,j} t)^{m_{h,j}-1}}{m_{h,j}-1} \right] \lambda_{h,j} e^{-\lambda_{h,j} t} dh dW + \int_{W=0}^{\infty} f_W(W) \int_{h=W}^{\infty} h \sum_{j=1}^{N_h} \alpha_{h,j} \left[\frac{(\lambda_{h,j} t)^{m_{h,j}-1}}{m_{h,j}-1} \right] \lambda_{h,j} e^{-\lambda_{h,j} t} dh dW = \int_{W=0}^{\infty} W f_W(W) \left[\sum_{j=1}^{N_h} \alpha_{h,j} \left(1 - \sum_{n_j=0}^{m_{h,j}-1} \frac{(\lambda_{h,j} W)^{n_j}}{n_j!} e^{-\lambda_{h,j} W} \right) \right] + \int_{W=0}^{\infty} f_W(W) \sum_{j=1}^{N_h} \alpha_{h,j} \cdot \sum_{n_j=0}^{m_{h,j}} \frac{m_{h,j} \lambda_{h,j}^{n_j-1} W^{n_j}}{n_j!} e^{-\lambda_{h,j} W} dW = \sum_{j=1}^{N_h} \alpha_{h,j} \left[\sum_{j=1}^{N_x} \alpha_{x,j} \frac{m_{x,j}}{\lambda_{x,j}} + \sum_{j=1}^{N_y} \alpha_{y,j} \frac{m_{y,j}}{\lambda_{y,j}} - \sum_{n_j=0}^{m_{h,j}-1} \frac{\lambda_{h,j}^{n_j}}{n_j!} \left(\frac{(-1)^{n_j+1} d^{n_j+1} F_W(s)}{ds^{n_j+1}} \Big|_{s=\lambda_{h,j}} \right) \right] + \sum_{j=1}^J \alpha_{h,j} \sum_{n_j=0}^{m_{h,j}} \frac{m_{h,j} \lambda_{h,j}^{n_j-1}}{n_j!} \left(\frac{(-1)^{n_j} d^{n_j} F_W(s)}{ds^{n_j}} \Big|_{s=\lambda_{h,j}} \right) \quad (1)$$

IV. Performance Evaluation

A. Number of Handover Messages

The performance is first evaluated by comparing the number of signaling messages with traditional handovers to the number of handover messages with the proposed technique. Considering that all handovers are intra-MME and intra-SGW, we find that the number of signaling messages for S1 and X2 handovers are 20 and 15, respectively [5]. Thus in our example, 20 messages are needed for an HeNB-eNB handover and 20 messages for an eNB-HeNB handover, i.e., a total of 40 messages per minute. Without this technique (i.e., with just regular handovers), there will be 5 HeNB-HeNB handovers, resulting in 75 messages

per minute. Thus there is a 47% reduction in the number of signaling messages when the proposed technique is used as compared to regular handovers.

Figure 4 shows the sum of the handover messages with the regular and proposed techniques. As the number of regular handovers increases, i.e., the subscriber moves with a greater speed, the number of handover message exchanges increases. In contrast, the proposed technique limits the number of handovers, and thus the total number of handover messages during the same period is low. The difference in the number of handover messages increases as the speed of the subscriber increases, thus making the proposed technique more beneficial for fast moving users.

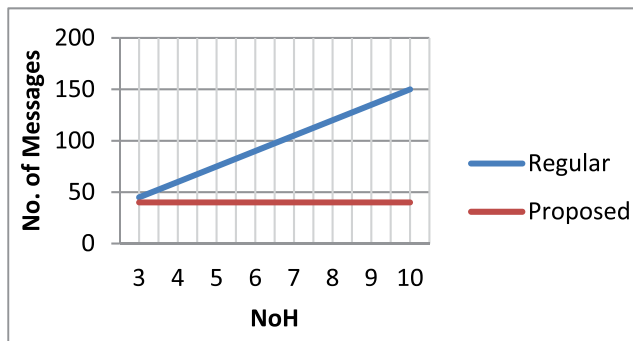


Fig 4: A comparison of the number of handover messages.

B. Downlink Service Interruption Time

In this section, the performance of the proposed approach is examined in terms of the Downlink Service Interruption Time (DL_SIT). Without loss of generality, as these parameters only determine the shape and scale of the distribution, the mixed-Erlang distributions for x , y and h have parameters $\alpha_{x,i} = \alpha_{y,i} = \alpha_{h,i} = 0.5$ and $m_{x,i} = m_{y,i} = m_{h,i} = 2$ for $i = 1, 2$ and $\lambda_{d,1} = 2\lambda_{d,2}$ where d is x , y or h .

Equation (1) was evaluated using the values mentioned above. Figure 6 shows the cumulative DL_SIT for the handovers versus the Retention Time (RT) during which the user is retained in the macrocell after handover from the femtocell. DL_SIT remains constant for the proposed technique as the user goes through a single HeNB-eNB handover and is retained in the eNB. For analysis purposes, we also assume that the user goes through a macrocell to macrocell handover during the Retention Time in the macrocell. DL_SIT increases almost linearly with time in the regular case due to the growing number

of handovers. The proposed technique shows no improvement for low retention times as DL_SIT is higher than with just regular handovers for low RT. This is understandable since the user is handed over to the macrocell and goes through an eNB-eNB handover, but is not retained there for a long time. The difference in cumulative DL_SIT between the regular and proposed techniques increases as the handover rate λ increases for the user, thus showing that the technique is very useful for moderate to fast moving users.

Assuming the Retention Time (RT) is 1 min, the HeNB-HeNB Handover Threshold (HHT) is 4, and the handover rate λ is 5, Fig. 7 shows the cumulative DL_SIT versus the Monitoring Time (MT) for the regular approach and the proposed scheme. DL_SIT remains the same for both the cases until MT exceeds 60 s. The user goes through 5 handovers per minute for the regular case, whereas for the proposed scheme, when the HHT value of 4 is exceeded, the user is handed over to the eNB and remains there for the RT time of 1 min. For analysis purposes, we assume that it goes through a single eNB-eNB handover during time RT. The user is offloaded to an HeNB after RT time and goes through handovers until the HHT is exceeded, at which time it is handed back to the macrocell, and so on.

Improper parameters for MT, HHT, NoH and RT may lead to macrocell congestion. For example, setting the HHT threshold too low will reduce DL_SIT for the user but the macrocell becomes congested more easily. Similarly, a value of RT which is too high will cause macrocell congestion, while a value which is too low will render the technique useless. The optimization of these parameters is left as future work as it depends on the particular network.

Conclusion

A technique was presented to reduce the number of handovers in femtocell networks. This is achieved by transferring fast moving users (who may initiate many handovers), to macrocells. This technique was shown to significantly reduce the number of handovers and also the network load compared to using just regular handovers. The proposed technique may increase the macrocell load, but this can be controlled by optimizing the parameters MT, HHT, NoH and RT.

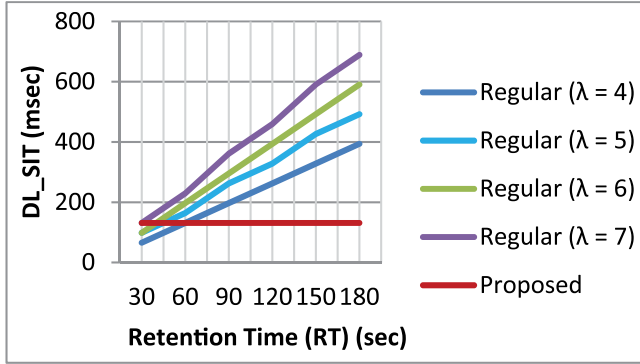


Fig. 5: Cumulative downlink service interruption time (DL_SIT) versus the retention time (RT).

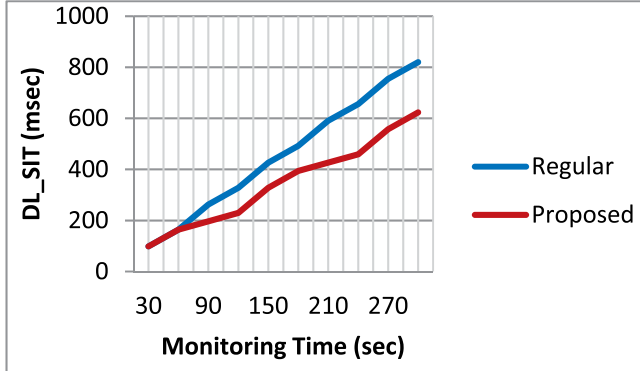


Fig. 6: Cumulative DL_SIT versus the monitoring time (MT).

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About Author



Engr. M. Asim Siddiqui

Engr. Mohammad Asim Siddiqui has been working in Telecommunication industry for the past 17 years. He has gained vast experience in Mobile Core networks, Radio networks planning and optimization and Value Added Services for communication networks. He has worked with Nortel Networks, Siemens, ZTE, MSI and Nokia in multiple capacities.

Mr. Siddiqui obtained M.Sc in Physics from Quaid E Azam University, Islamabad in 1995 under the supervision of well-known Physicists of Pakistan and received prestigious President's scholarship during his studies there. He then completed MS in Electrical Engineering in 1999 from University of Oklahoma, USA and continued to work on various research projects at the same university. He joined Nortel Networks 3G Core R&D team in Dallas and participated in the initial design of 3G networks and worked with ZTE and Siemens on Radio and Core networks for multiple operators in several countries.

He has been working with Nokia in Saudi Arabia since 2007. Being part of services integration team, he has designed and commenced several key projects for the mobile operators in Saudi where he has performed technical management, solutions architecture and design, implementation and integrations with existing networks. He has also been participating in Nokia 5G research meetings.

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خودی کو کر بلند اتنا کہ ہر تقدیر سے پہلے
خدا بندے سے خود پوچھے بتا تیری رضا کیا ہے
(اقبالؒ)

First Company Offering Housing Ownership Opportunities to Pakistani Community

We Are Changing The Paradigm
Own A Property In Saudi Arabia
Own A Residential Flat

Local Partners
DAMAC
Properties
(Ali Habib Kukar
Real Estate)

Taqniya Launching a Residential Project in City of Taif, KSA:
10 Minutes Drive from Taif Airport, 20 Minutes from Meqaat.

SAUDI ARABIAN LAW OVERVIEW (REAL ESTATE)

Until the year 2000 the ownership of real estate in Saudi Arabia was reserved to Saudi Arabian citizens, and GCC nationals in limited circumstances to the extent of owning a private residence of not more than 3,000m2. By Royal Decree M/15 of 17th Rabi Thani 1421 Hejra corresponding to 19th July 2000 Gregorian foreign interests were granted the right to own real estate in the Kingdom, with the exception of the holy cities of Makkah and Madinah, in the following circumstances:

- Foreign interests which are licensed to conduct business in Saudi Arabia may acquire the property required for the business premises and for the accommodation of their employees.
- If the license to conduct business in Saudi Arabia includes the right to engage in the real estate business by buying, developing, selling and/or letting property, the value of the land and buildings must not be less than thirty million Saudi Riyals, and land purchased to this end must be developed within at least five years from the date of purchase.
- Foreign individuals who are resident in the Kingdom may acquire real estate for their own private residence after having obtained the permission from the Ministry of Interior. Furthermore, property may be acquired for private residential purposes with the permission of the head of the Council of Ministers.
- Lastly, the restriction on foreigners owning property in the holy cities of Makkah and Madinah does not apply to property acquired by way of inheritance, which is subject to special rules.

Cross Channel And Session Variability In Speaker Recognition using MDLR-Mavg

By

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Abstract

The biggest challenges in Speaker recognition are channel and session variability. In this paper, a new technique is proposed that is based on Multi-Dimensional Linear Regression and Moving Average (MDLR-Mavg). This technique is based on linear regression along the time axis, the frequency axis and taking moving average on the time-frequency axis. Regression captures the voice onset offset of a speaker, whereas, moving average capture the dynamics on the time and the frequency axis. The performance of different techniques across varying channel train/test conditions and varying session are presented and discussed. King Saud University Arabic Speech Database available through Linguistic Data Consortium is used to evaluate the variability. The result has shown that the proposed technique outperformed the traditional features used in speaker recognition.

1. Introduction

Mismatch in training and testing speech of a speaker are the two main sources of performance degradation in speaker recognition. This mismatch is due to the fact that speaker's voice change due to the aging and language variability. Other factors such as mismatch in microphones, channel distortion, environment noises etc. also effect the recognition rate. In this paper, we will refer to speaker related problems as session variability and rest as channel variability. Intersession variability and channel variability are of interest of speaker recognition community for years, and numerous techniques have been proposed [2, 3, 4, 5]. Most of the methods are applied to the telephonic speech where variability is due to dissimilar handsets, diverse environments, changed transmission channels and different scenarios [1]. Recently, much more research has been conducted to check the effect of cross channel and session variability problem using non telephonic speech. The system is trained using speech recorded using different channels and tested with the speech samples recorded using dissimilar channels.

In LDC KSU speech database [10], four different channels have been used to record the speech database. These channels are used to investigate the channel variability. A similar kind of dataset is recorded and named as NIST SRE2008. KSU speech database was recorded using Arabic language where-

as NIST is recorded mainly using English language. The mismatch in channels for training and testing has got a new challenge. To encounter these challenges, several techniques have been proposed. In [3], algorithms to enhance the speech were used to remove the noise and tone. In order to compensate the Gaussian mixture model (GMM) and support vector machine (SVM), Latent Factor Analysis (LFA) and Nuisance Attribute Projection (NAP) were used to model the speaker. In [2] common channel compensation methods were investigated in telephonic speech systems. As a result, it was found that some methods such as RelAtive SpecTrAl (RASTA) filtering, score normalization and feature mapping did not improve the system performance. In [4], the feature-domain latent factor analysis was proposed, that outperformed the conventional model-domain method. A joint factor analysis modeling technique was proposed in [6]. Though it performed better but complexity increased significantly. In some other research papers different techniques have been proposed to overcome the cross channel and session variability. For example, PYKFEC feature outperformed conventional MFCC [7], but when Lawson tested it in cross channels and noisy channels, it did not perform well [8]. Similarly, Qi Li and Huang proposed cochlear filter cepstral coefficients (CFCC) and it performed better compared with conventional features MFCC and RastaPLP in cross channel [9]. When Lawson et al., used CFCC in the clean channel, it did not perform well [8]. In this paper, a proposed technique will be analyzed and the performance in cross channel and session variability will be studied. In Section 2 proposed MDLR-Mavg is presented that outperformed MFCC and other conventional speech features in speaker recognition with the cross channel and session. In Section 3 LDC KSU database is presented. Section 4 described the experimental setup and analysis and in end conclusion is presented that will show that these proposed features are more robust to channel and session variability than conventional features.

II. The Proposed MDLR-Mavg

In the proposed MDLR-Mavg, a windowed speech signal is processed by FT and passed through a Mel-scaled Filter Bank, followed by logarithmic compression. Later, linear regression is applied in two different directions, horizontal (time axis) and vertical (frequency axis), capturing the voice onset/offset of the speaker. Similarly, a three-point moving average is applied on 45 degrees (time-frequency) and 135 degrees (time-frequency), which captures the dynamics of speaker.

Figure 1 shows a block diagram of the proposed technique. The features extracted using the following four different equations 1, 2, 3, and 4, respectively.

$$\text{Along time: } LR1 = d_{t,f}^t = \frac{\sum_{i=1}^k (c_{t+i,f} - c_{t-i,f})}{2 * k} \quad (1)$$

$$\text{Along frequency: } LR2 = d_{t,f}^f = \frac{\sum_{i=1}^k (c_{t,f+i} - c_{t,f-i})}{2 * k} \quad (2)$$

$$\begin{aligned} &\text{Along time-frequency at } 45^\circ: \\ &= c_{t,f}^{45} = \frac{\sum_{i=1}^k (c_{t-i,f-i} + c_{t+i,f+i})}{2 * k} \quad (3) \end{aligned}$$

$$\begin{aligned} &\text{Along time-frequency at } 135^\circ: \\ &= c_{t,f}^{135} = \frac{\sum_{i=1}^k (c_{t+i,f-i} + c_{t-i,f+i})}{2 * k} \quad (4) \end{aligned}$$

The value of “k” is 3, as three-point linear regression and three-point MA are applied.

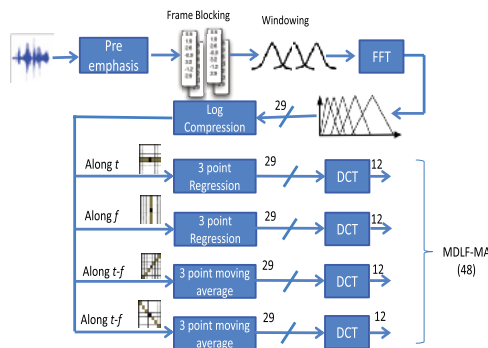


Figure 1:Block diagram of the proposed MDLR-Mavg feature-extraction method.

III. Database

The speech databases used to evaluate the performance of the proposed features is the LDC KSU database [10]. The KSU database is very rich, containing different types of words, sentences, paragraphs,

and answers to questions. Explanation of each type of text is provided in [10]. There are three sessions in this database. In each session, the speech utterances were recorded in two or three distinct environments (a soundproof room, an office, and a cafeteria). In each place, at least three different types of microphones were used for recording (high-quality microphone, medium-quality microphone, and a mobile phone). For this work, we selected the second session for cross channel variability and all the three sessions for session variability. For cross channel we used a high-quality microphone with Yamaha mixer, a medium-quality microphone with computer and a medium-quality microphone with average quality sound card, to evaluate the performance of the proposed feature. The sampling rate was 16 KHz, with 16-bit resolution.

IV. Experimental setup and discussion

i. Cross Channel Variability

In an initial investigation, the system was trained with speech captured by a high-quality microphone and recorded by mixer (Yamaha) and tested with speech captured by medium quality microphone and recorded using the computer built in sound card. Training speech utterance was SAAVB_1 and testing speech utterance was SAAVB_2. The result for the three cases of male, female, and mixed gender speakers is presented in Table 1.

Table 1: Cross channel recognition rate (%) for three cases.

No. of Speaker Feature Extraction	(Male) 120	(Female) 62	(Mixed gender) 182
MDLR-Mavg	90.83	96.77	92.86
MFCC	84.17	95.16	90.10
RastaPLP	93.33	85.48	90.66

Since there is a channel mismatch the recognition rate degraded as compared with the results of same channel. The LPCC performed worst in this case, so we did not present its results. MDLF-Mavg performed better than MFCC for the three different speaker cases. Compared to RastaPLP it performed better except in the case of male speakers.

For further investigation we evaluated the performance of cross channel for mixed gender for four cross channel cases, and result is presented in Table

2. We used three different channels, which are.

- Speech recorded by high-quality microphone and Yamaha mixer (we named it Yamaha)
- Speech recorded by medium quality microphone with a high-quality creative sound card (we named it Creative).
- Speech recorded by medium quality microphone with a personal computer built-in sound card (we named it Computer)

All the speech samples were recorded in office environment. From Table 2 we find that the proposed features MDLR-Mavg performed better compared to the conventional features in the four cross channel cases. In most of the cross-channel SR systems, the recognition rate decreases as compared to recognition rate achieved when using the same channel.

Table 2: Cross channel recognition rate (%) for mixed gender.

Training channel	Testing channel	Recognition rate (%)	
		MDLR-Mavg	MFCC
Computer	Yamaha	95.05	94.51
Yamaha	Computer	92.86	90.10
Yamaha	Creative	86.26	82.42
Creative	Yamaha	80.77	78.57

ii. Session Variability

SR is to decide whether two utterances have been uttered by the same speaker or by different speakers. These differences between the two utterances of the same speaker could be due to the speaker’s health, age or emotional state. In other words, the utterance recorded in one session could be different from the utterance recorded in another session. This variation is called session variability. In SR, session variability is of primary importance.

While recording the LDC KSU database, we recorded at three sessions. This allowed us to check the performance of proposed features for the session variability. For the session variability, we divided the analysis into two parts.

- Training with one session and testing with other sessions.
- Training with two sessions and testing with one session.

Table 3 presents the results when speech from one session was used in training. The numbers of speakers differs from one experiment to another. This is because we selected only those speakers who are common in both sessions. When we used the proposed features for session variability, their results were excellent, they achieved almost 20% higher recognition rate as compared to the conventional MFCC; MFCC got 64.84% recognition rate whereas MDLR-Mavg achieved 80.22% recognition.

From the results in Table 3 it can be observed that training with session 1 and testing with session 3 gave the lowest recognition rate. This can be attributed for the long time gap between these two sessions. Training and testing with consecutive sessions (train with session 1 and test with session 2 or train with session 2 and test with session 3) gave very good results and were better than train with 1 and test with 3.

Table 3: Recognition rate (%) when SR is trained with one session.

No. of speakers	182		102		101	
Features	SESSION		SESSION		SESSION	
	TRAIN	TEST	TRAIN	TEST	TRAIN	TEST
	1	2	1	3	2	3
MDLR-Mavg	80.22		70.59		80	
MFCC	64.84		54.90		65	

In second case of session variability, we trained the SR system using two sessions and tested with one session. Training a SR using two sessions achieved better recognition rate as compared to training SR with one session as given in Table 4.

Table 4: Recognition rate (%) when SR is trained with two sessions.

No. of speakers	101		101		101	
Features	Session		Session		Session	
	TRAIN	TEST	TRAIN	TEST	TRAIN	TEST
	1 & 2	3	1 & 3	2	2 & 3	1
MDLR-Mavg	88.12		91.09		86.14	
MFCC	71.29		81.19		71.29	

When SR is trained with session 1 and session 3 recorded utterances and tested with session 2 utterances, the recognition rate was highest. This can be justified by the fact that middle session, session

2, has similarity with both first and third session. In this investigation MDLR-Mavg performed better than MFCC with almost 15% improvement.

V. Conclusion

We investigated robustness of the proposed features for channel and session variability. The proposed techniques performed better as compared to the conventional MFCC in the channel and session variability that shows the robustness of the proposed features.

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Ta'if

Ta'if (Arabic: الطائف; (at-Ṭā'if)) is a city in Mecca Province of Saudi Arabia at an elevation of 1,879 m (6,165 ft) on the slopes of Sarawat Mountains (Al-Sarawat Mountains). It has a population of 1,200,000 people and is the unofficial summer capital. The city is the center of an agricultural area. The inhabitants of Ta'if are largely made up of Saudi Arabians. There are also significant foreign populations, primarily from Asia, Turkey, and other Arab countries that are also present in Ta'if. In the 6th century the city of Tā'if was dominated by the Banu Thaqif tribe, which still lives in and around the city of Taif today. It has been suggested that Jewish tribes who were displaced by Ethiopian Christians in the Himyarite Kingdom were settled near Taif.

The town is about 100 km (62 mi) southeast of Mecca. The walled city was a religious centre as it housed the idol of the goddess Allāt, who was then known as "the lady of Tā'if."

Its climate marked the city out from its dry and barren neighbours closer to the Red Sea. Wheat, vines, and fruit were grown around Tā'if and this is how the city earned its title "the Garden of the Hejaz".

During the Year of the Elephant, this city was involved in the events.

Both Ta'if and Mecca were resorts of pilgrimage. Ta'if was more pleasantly situated than Mecca itself and the people of Ta'if had close trade relations with the people of Mecca. The people of Ta'if carried on agriculture and fruit growing in addition to their trade activities.



Pakistan's Energy Crises - Analysis & Remedial Solutions

By

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Abstract

Pakistan has been encountering the worst energy crisis in its history since 2006. The shortage of power has resulted in long term load shedding which threatens to not only stop the industrial growth but also suspend social activities. The paper covers the reasons of energy crises, steps taken by the government, action plan meets the future electricity demand and make it affordable to the public. It also covers comparison of the power projects expected to produce power and the future demand.

I. Introduction:

Energy crisis has caused load shedding and increased the cost of electricity which has greatly affected the country's already crumbling economy. Needless to say, the industrial sector and small businesses are facing a hard time keeping their machines running. This crisis has paralyzed cities and villages. Moreover, it has made life difficult for citizens. Media and authorities tend to have different views and this gets the citizens confused. In this regard, many local and international organizations published reports to try to find out the facts that have led to this miserable condition. It was realized that no major power capacities were added to meet the power demand in the past years and most of the generation is by liquid fuel. This is a great negligence of planning and implementation of the new projects.

The government addressed this critical issue. Two major targets were set

- (i) mitigate the shortage of power;
- (ii) provision of affordable tariff to consumers.

Pakistan generates its significant portion of electricity from the liquid fuel which is expensive, whereas all other countries except the oil rich states generate their power with coal or other cheap resources available to them. The increase in tariff with time is mainly due to increase in the prices of furnace oil & gas, and devaluation of the Pak Rupee. This is the major reason for the high tariff and this is why National Electric Power Regulatory Authority (NEPRA) determines the tariff frequently based on the variation in the liquid fuel prices. The cheapest energy is

produced by the coal as conventional fuel and hydel power as a renewable energy. Coal is the most leading source of fuel in power generation with 40% of globally generated power relying on this fuel. China contributes 50% to global coal demand and is shifting to clean coal technologies. India's coal consumption is also set to increase, while the US is closing or replacing coal with gas in power plants.

II. Pakistan and Global power generation resources

Global Source of Power Generation has been provided in Figure-1. All over the world 39% of electricity is produced from coal, 22% by gas, 17% by hydel, 11% by nuclear and only 5% energy is produced by liquid fuel (oil) which is an expensive fuel.

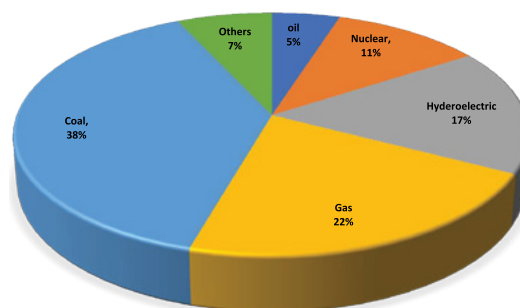


Figure-1. World Electricity Production of 2014

Electricity Generation Sources of Pakistan have been mentioned in Figure-2. It's disappointing to know that Pakistan generates 40% of its power by expensive fuel (oil) which is imported at a high cost, 28% from hydel (cheap source of energy), 27% from gas (own resource), 4% from nuclear plants and only 1% from coal.

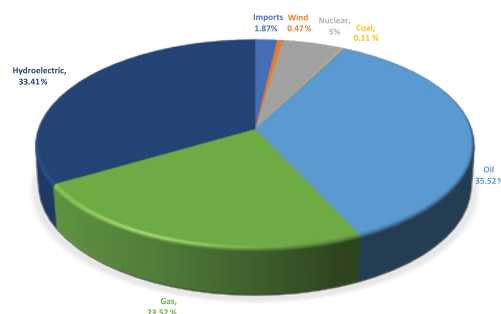


Figure-2. Power System Statistics 2014 - 2015

The tariff is higher because major part of power is produced by expensive fuel.

According to World Energy Statistics 2011, published by IEA, Pakistan's per capita electricity consumption is one-sixth of the World Average. World average per capita electricity consumption is 2,730 kWh compared to Pakistan's per capita electricity consumption of 451 kWh only. USA has the maximum of 14,000 kWh and

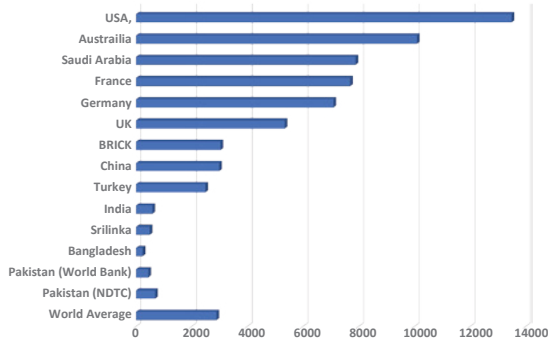


Figure-3. World Development Indicator 2013, World Bank.

Bangladesh has the lowest per capita electricity consumption. International Energy Agency forecasted that total electricity demand of the country will be 49,078 MW in 2025.

III. Conventional and Renewable Energy Resources of Pakistan

Pakistan has a great potential of Hydel power, namely 60 GW which is an economical source of power generation, but unfortunately generates only 28% of the available potential resource. We have huge resources of gas but generate only 27% of our electricity by gas. Pakistan ranks sixth among coal-reservoir countries and has total estimated coal reserves of over 186 billion tones but only 1% is used to generate electricity. Unfortunately, quality of coal is poor (it has lower heat content and high water content). It costs more to produce electricity from domestic coal than imported coal available in international market. However, the government is in full effort to resolve this issue by working with various international and domestic organizations.

Pakistan has the required potential to meet these energy challenges and hydroelectric power alone is enough to meet our existing demand if the issue is resolved with proper planning, but there are political and environmental issues in building dams.

Wind energy also has strong technical potential, particularly in the southern regions of Sindh and Baluchistan provinces. Pakistan has approximately 1,000 km of coastline with steady average wind speeds ranging between 5-7 meter/sec. The projected capability for wind energy is estimated at 122.6 GW per year, which can provide about 212 TWh of electricity to the country. AEDB Wind status as of December 2016 is that the installed capacity of Wind is 591 MW and 1,157 MW projects are in pipe line.

Pakistan is located in the Sun Belt therefore solar system can be used across the country. Average Sunshine is 8-10 hours per day. Annual solar radiation intensity greater than 200 W/m² was observed in almost every part of the country except some of the coastal and northern regions. The total power generation capacity of solar photovoltaic power is estimated to be 1,600 GW per year. The Pakistan Engineering Council (PEC) also participated and launched Pakistan first on-Grid Solar Power System of 178 KW/h, which became operational in the year 2013. However, more penetration of Solar and Wind power requires insight to solve the transmission network challenges.

Pakistan is adapting to the Renewable energy resources especially Wind & Solar power, but not fast enough. The National Electric Power Regulatory Authority (NEPRA) issued its first set of licenses for rooftop solar plants last year. Also, NEPRA asked for public comments on competitive bidding for generation and transmission projects. The next announcement of so-called "upfront tariffs", expected this year, is likely to be the last before the country embraces competitive bidding. NEPRA proposed a tariff of about 8.2 US Cents per unit for wind, and 9.4 – 10 US Cents for solar, depending on the location and the capacity.

IV. Type of Consumers in Pakistan

Pakistan has various types of electricity consumers as shown in Figure 4; household sector is the largest consumer of electricity accounting for 44.2% of total electricity consumption. The second largest electricity consumer is the industrial sector which consumes 31.1% of total electricity consumption. The industries cannot operate at maximum capacity because of power cuts, which affects the production, and rise in prices.

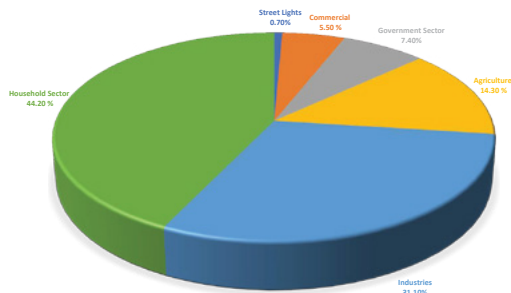


Figure-4. Type of Consumers

The third largest consumer is the agriculture sector which consumes 14.3% power outage not only causes the wheat shortage in the country but also other agricultural products, Water supplies are also affected, as pumping and purification stations shut down frequently. Government sector consumes only 7.4%, and commercial consumers account to only 5.5%

V. Major Power Producers and their Capacities in Pakistan

A brief introduction on the existing public and private power producers is provided as per year 2015:

1. Water and Power Development Authority (WAPDA) provide Hydel power
2. K-Electric former Karachi Electric Supply Corporation, KESC (operates in Karachi)
3. Generation Companies (GENCOs)
4. Pakistan Atomic Energy Commission (PAEC)
5. Independent Power Producers (IPPs)
6. Alternate Energy Development Board (AEDB) for renewable energy

Table-1. Public and Private Power Producers and their Capacities in MW of year 2015:

Public and Private Power Producers	Capacity in MW
Water and Power Development Authority (WAPDA)	7,114
Karachi Electric Supply Corporation (KESC)	1,984
Generation Companies (GENCOs)	5,924
Pakistan Atomic Energy Commission (PAEC)	787
Independent Power Producers (IPPs)	8,691

Public and Private Power Producers	Capacity in MW
Alternate Energy Development Board ((AEDB	Wind 256
(TOTAL (2015	Solar 100
	24,856

Source: Analysis of Pakistan's Electric Power Sector by Blekinge Institute of Technology March 2015

The installed power generation capacity in 2015 was 24,856 MW and increased to 25,857 MW in 2016 which is an addition of 1,001 MW.

Forecast peak load demand and mitigation

In the next 10 years, Pakistan peak electricity demand will raise by 4-5% according to the National Transmission & Dispatch Company (NTDC).

Table-2. PEPCO Load Forecast from year 2015 to 2022

Year	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
Peak Demand (MW)	26,290	27,679	29,424	31,464	33,691	36,104	38,666

Source: Planning Power NTDC period 2011 to 2035

The power shortage started from 2006 and as the government of Pakistan claims that power shortage will be in control by year 2018 bringing an end to load shedding. Figure-5 shows the MW capacity added each year of various fuel sources.

It is evident that the planners have successfully replaced the expensive liquid fuel with LNG. According to expert LNG is not cheap as expected.

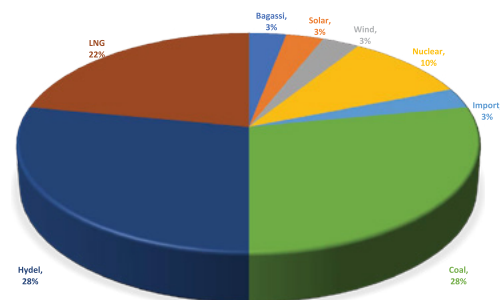


Figure 5. Generation Capacity 2022

Table-3 shows generation projects and their capacities of various fuel sources which are expected to complete from year 2016 to 2022. The table also

shows the total generation capacity, forecast peak demand and the difference in peak demand and generation capacity. This information is gathered from the under construction projects developed by WAPDA, GENCO's, PPIB, AEDB, and PAEC. The total capacity of under construction projects is 29,302.5 MW during the years 2015 - 2022.

Table-3. Generation Capacity of various sources from year 2016 to 2022

Summary of Generation Capacity (MW) Addition									
Year	Nuclear	Wind	Solar	Bagasse	LNG	Hydel	Coal	Import	Total
2016-17	340	346.5	700	82	3,400	1,557	0	0	6,425
2017-18	0	399	0	211	1,200	969	2,640	0	5,419
2018-19	0	50	0	0	0	208	4,773	0	5,031
2019-20	0	0	0	524	1,920	128	0	1,000	3,572
2020-21	1,100	0	0	0	0	4,290	0	0	5,390
2021-22	1,100	0	0	0	0	970	660	0	2,730
Grand total	2,880	975.5	900	832	6,520	8,122	8,073	1,000	29,302

Source: Pakistan Energy Vision 2035 & Summary of Generation addition

Pakistan government will become successful in ending load shedding if all the projects under development are completed on time. A major accomplishment for Pakistan will be access MW capacity after year 2018. It seems that Government of Pakistan has addressed the issues and designed crash programs to overcome the power shortage in due time. It is expected that there will be no load shedding due to presence of access power.

Table-4 shows that in year 2017 generation capacity is enough to meet the peak load demand with addition to access/standby power till the year 2022 if all the projects are completed on time.

Table-4. Generation Capacity added from 2015 to 2022

Year	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
New Project added capacity in MW	6,425.5	5,419.0	5,031.0	3,572.0	5,390.0	2,730.0
Total Generation Capacity in MW	29,501.5	34,920.5	39,951.5	43,523.5	48,913.5	51,643.5
System Peak Demand in MW	27,679.0	29,424.0	31,464.0	33,691.0	36,104.0	38,666.0
Reserve Power in MW	1,822.5	5,496.5	8,487.5	9,832.5	12,809.5	12,977.5

The citizens are interested in two things (i) getting rid of the power cut; and (ii) provision of electricity at an affordable cost. According to Government of Pakistan, it has achieved both targets. Refer to Table-3, added power projects are of cheap sources of energy i.e. 8000 MW of hydroelectric, 2880 MW of nuclear and 8000 MW of coal till year 2022. These upcoming projects will help to bring down the tariff and the citizens of Pakistan will feel more relieved. However, summer 2017 will let us know the truth.

VI. Challenges

There are some challenges which still need to be addressed very intelligently otherwise the efforts made in this regard will become useless.

- vii. The utility companies are facing problems due to high oil prices. In the past, rising prices of oil were a major cause of power disruption and sometimes it was noticed that the high cost of fuel forced shutdown of the generating units.
- viii. Regardless of \$ 5 Billion debt payment, the accumulation of circular debt in the electricity sector over the past few years is devastatingly high. The circular debt also makes it more difficult for power producers to invest in upgrading existing electricity infrastructure. If power producers don't have the money to operate oil based power plants at full capacity, they certainly do not have enough capital to build new, more efficient power plants. Even when the lights are

- on, the inefficient electricity system takes an additional toll on the country's economy. Pakistanis today pay more than double their Indian neighbors for electricity (16.95 Pakistani Rupees vs. 7.36 Pakistani Rupees per KWh respectively).
- ix. The regulated tariffs on retail electricity prices kept revenues too low to make it worthwhile for utilities to invest in their delivery or generation infrastructure, preventing the network from keeping up with rising demand.
 - x. Hydropower is generated from dams (28% of total generation). Due to low rainfall, reduced water levels decrease the total power output from dams. The other factor is the restrictions on water release from the dams due to irrigation purposes.
 - xi. Apart from further power generation, adequate maintenance of existing installed power stations, transmission lines and distribution system is required to prevent power loss. Most of the existing power generation plants are operating at very low efficiency. Authorities have to set a plan to increase the efficiency of these inefficient old generation plants, transmission and distribution lines as well.
 - xii. The transmission towers and natural gas supply infrastructure has been damaged particularly in Baluchistan from where most of the gas is supplied to the power plants.
 - xiii. The Industries that consumes high percentage of energy should be encouraged to setup energy conservation systems and produce their own generation setup.
 - xiv. Transmission losses (i.e. power theft) are about forty (40) percent including line losses in the distribution system. 25% losses are the case of theft "KUNDA" system in which mostly electric utilities employees are involved. It is a very serious matter which the Transmission & Distribution companies should solve by any means.
 - xv. Government of Pakistan has successfully converted the power plants operating on liquid fuel with imported LNG but unfortunately the cost of imported LNG is not so

cheap that help to lower the consumer tariff.

Conclusion

These above issues will be solved if the Government, politicians and the citizens will remain on one page. It isn't only the Governments' responsibility, although Government is the powerful authority to play active role to mitigate such crisis, but the citizens too have to play their role.

To avoid such crises in future the Government has to plan and implement the source and demand side management and the citizens have to follow the demand side management. The policy makers on the side of energy source management need to have a divergent thinking to utilize the indigenous resources like hydro, coal and renewable energies in addition to allow or give incentives to small Solar PV/ Wind turbine roof top consumer based generation. On demand side management-the policy makers and the citizens both have to implement rules like early market shutdown, two days holiday per week, use of efficient electrical equipment/appliances, encourage LEDs lighting systems and peak tariff structure. Apart from a few notable exceptions, the pattern of policymaking in Pakistan seems to be premised on short-term crisis response rather than on an informed longer-term vision and a determination to implement it, backed by unwavering political will. For the promotion of Wind and Solar PV power, Pakistan has taken few initiative steps like AEDB has been able to encourage a couple of investors for domestic manufacturing, Two facilities are manufacturing turbine towers: one is the local engineering company DESCON, and the other is China Three Gorges. For solar, there are five companies assembling solar panels.

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Apple iPhone Facts

Even though the iPad came out a few years after the iPhone, Apple was actually exploring a tablet device before the idea for an iPhone even began to take shape. As relayed by Steve Jobs himself during a 2010 All Things D in terview, Jobs explained how he wanted Apple engineers to research various tablet designs with a virtual keyboard. When they came back to him with a device featuring multitouch functionality, Jobs thought that Apple could apply that technology to a phone. As Jobs told Walt Mossberg, Apple "put the tablet aside and we went to work on the phone.". Apple CEO Tim Cook announced that Apple has sold over 700 million iPhones. Apple's earnings reports suggest that cumulative iPhone sales may fast be approaching 800 million. If we conservatively estimate that current iPhone sales fall in the 750 million range, that means Apple has been averaging approximately 7.8 million iPhones a month for eight years running now.



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Enterprise Risk Management

By

Tariq Bin Zafar Al-hussaini

Certified Risk Manager

Abstract

Organizations are employing internal controls to manage financial risks, however operational risks were not seriously addressed by the organizations, instead of internal risk controls, organizations were achieving operational excellence through quality tools mainly six Sigma, lean management, just in time (Toyota production System), etc. However, with the introduction of Sarbanes-Oxley Act now the organizations must select and implement a suitable internal control framework. Section 404 of SOX stipulates that management must demonstrate control over financial and operational reporting and changes to existing and new software in IT. The Sarbanes-Oxley compliance will be one of the challenge to the organizations operating in north America and worldwide. This presentation will cover basic concepts of Risk, Risk Management, Risk Management System and Enterprise Risk Management and Corporate governance (3Cs, 4Ps, Mc-Kenzie 7s, 4Ts, 5W+2H, Balance Score card, Porter's 5Forces, Tone at the top, Governance Risk compliance maturity models, ISO31000, COSO 5 Cube, COSO 8 Cube and Risk based auditing).

Introduction:

All organizations irrespective if they are big or small, public or private, for profit or charity, face uncertainty. Uncertainty results in risks. In future, more organizations will face uncertainty in design, implementation and quality assurance, environmental management, information security management. The critical leadership challenge at present and in future will be how to address risk resulting from uncertainty. This article covers how enterprise risks are managed.

Volatility-uncertainty-complexity-Ambiguity

We are living in VUCA time;

Volatility is the dynamics of change, what type of change it is, what is its speed and how forceful it is, and who is causing this change.

Uncertainty relates to unpredictability of events, type of a surprise, no awareness and understanding of issues.

Complexity relates to multiplicity of forces, issues, chaos and confusion that surround an organization.

Ambiguity it is like fog, a fog of reality, lack of clarity, cause and effect confusions.

Understanding **VUCA** makes everyone a risk manager in the organization



Fig-1

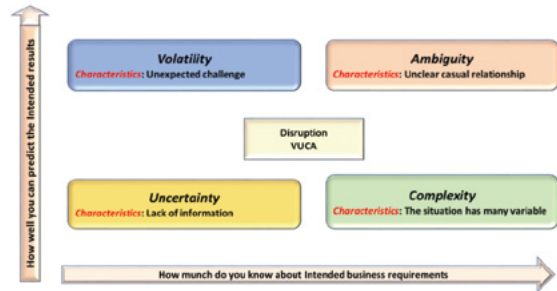


Fig-2

Enterprise Risk Management:

ERM is a process, effected by an organization's *Board of Directors, Management Committee* and other personnel, applied in *strategy setting* and across the enterprise, design to identify potential events that may affect the organization, and manage risk to be within its risk appetite, to provide reasonable assurance regarding the achievement of organization's objectives. (COSO).

Why ERM

Lack of effectiveness and efficiencies with in the enterprise create silo effects, redundancies and inconsistencies that ultimately result into *Reputational risks* (loss of brand equity, creditability of the organization), *Operational risks* (weakness in project management and process controls, breakdown of monitoring controls, technological innovation), *Supply risk* (poor performance of the suppliers)

The solution is to manage VUCA, i.e risks across the organization as per the risk appetite and risk tolerance of the organization. Integrate risk with other disciplines into coordinated response.

Current state of ERM

At present, it is focused on banking, pharma and other industries. Operational risks and suppliers, risks are still in the development stage, it is still a new concept with standards like ISO9001, 27001, 28000, 22000 and others. ERM will be integrated into all elements of management of operations, it's a cultural transformation

ERM Drivers

Global Public Safety: Global Safety issues, Ebola breakout, CO2 Emission, global warming, water shortage, Hurricanes, Critical infrastructure protection (public places, airports, railway stations, bus stands), Health & Safety, Aerospace safety, Cyber security

Reporting: Inadequate disclosure, markets volatility, reliance on suppliers, customers, governments, certain employees, legal position, weak internal controls, conflict of interest, history of operating losses

Governance: Assign the responsibility of risk oversight to the board of directors and the burden of risk oversight to the risk management committee; Consider critically full depth of material risks that can impact the organization. Ensure a deep understanding of the key risks, right expertise on the board, healthy diversity, engagement of board and management committee, embed risk discussion in all board processes, make risk management actionable, take ownership of improving risk management in the organization

Technology: Critical processes will transform how we interact with the physical world (Internet transformation), Cyber -physical system integrates computing, communication and storage capabilities with the monitoring in the physical world

Unknown: Unknown events, business disruption, poor understanding of problems, black swans

Risk Framework:

A framework is an architecture, they follow logical cycle, guidance, upon which to build risk strategy, establish control objectives, assure risk and monitor performance.



Fig-3

Purpose of the Risk framework:

Risk framework provide common approach to archi-

tect, design, deploy and assure risk. It helps in imbedding Risk Management throughout the organization and supply chain. Ensure consistency in language, applications, and understanding risk taxonomy. It also provides an approach in consistent decision making and problem solving, ensures alignment with strategy and objectives, assign risk control accountabilities, ensure right resources and communication benefits to shareholders.

ERM Frameworks:

1. ISO 31000:2015
2. COSO (5 & 8)
3. NIST 800-37
4. COBOT 5

ISO 31000: It has been adopted as a national risk management standard by more than 60 countries, it identifies, needs, expectations and, risks associated with Stakeholders, customers, and other interested parties. It provides, guideline to evaluate upside and downside risks, design and implement supply risks, report

documents the results and effectiveness of risk treatment and risk management, communicate the effectiveness of the system to stakeholders, monitor and review risks based on risk appetite and risk tolerances.



Fig-4
ISO 31000 Risk Management Framework

COSO 8 ERM Framework

This the framework established by the Committee of Sponsoring Organizations of the Treadway Commission (COSO), this framework is the *de facto* framework used by most of the organizations required to comply with Section 404 - Internal Controls over Financial Reporting (ICFR) requirement of the Sarbanes-Oxley Public Company Accounting Reform and Investor Protection Act (SOX). COSO broadly defines enterprise risk management (ERM) as "The culture, capabilities and practices integrated with

Enterprise Risk Management

strategy-setting and its execution, that organizations rely on to manage risk in creating, preserving and realizing value.

The framework provides eight components for use when evaluating ERM:



Fig-5
COSO 8 Risk Management Framework



Fig-6
COSO 5 Risk Management Framework

- 1. Internal Environment;** The internal environment sets the foundation for how risk is viewed and addressed by an entity’s people, including risk philosophy and risk appetite, integrity, ethical values, and the environment in which they operate.
- 2. Objective-Setting;** Objectives must exist before management can identify potential events affecting their achievement. ERM ensures that management has in place a process to set objectives and that the chosen objectives support and align with the entity’s mission and are consistent with its risk appetite.
- 3. Event Identification;** Internal and external events affecting the achievement of an entity’s objectives must be identified, distinguishing between risks and opportunities.
- 4. Risk Assessment;** Risks are analyzed, considering likelihood and impact, as a basis for determining how they should be managed. Risks are

- assessed on an inherent and a residual basis.
- 5. Risk Response;** Management selects risk responses—avoiding, accepting, reducing or sharing risk—developing a set of actions to align risks with the entity’s risk tolerances and risk appetite.
 - 6. Control Activities;** Policies and procedures are established and implemented to help ensure the risk responses are effectively carried out.
 - 7. Information and Communication;** Relevant information is identified, captured and communicated in a form and timeframe that enable people to carry out their responsibilities. Effective communication also occurs in a broader sense, flowing down, across and up the entity.
 - 8. Monitoring;** The entire ERM process is monitored, and modifications made as necessary. Monitoring is accomplished through ongoing management activities, separate evaluations or both.

NIST 800-37 Risk Management Framework

NIST has developed a common information security framework for the US federal government and its contractors. The intent of this common framework is to improve information security, strengthen risk management processes, and encourage reciprocity among federal agencies. It is a six step Risk Management Framework (RMF)

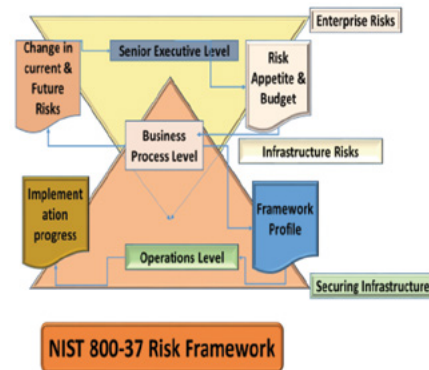


Fig-7

COBIT 5

It provides stakeholders with a better understanding of the current state of risk and its impact throughout the organization, guides how to manage the risks including measures, guidance to set up a risk culture, guidance on risk assessment in cost control, opportunities to integrate IT risk management and Enterprise risk management, improved communications

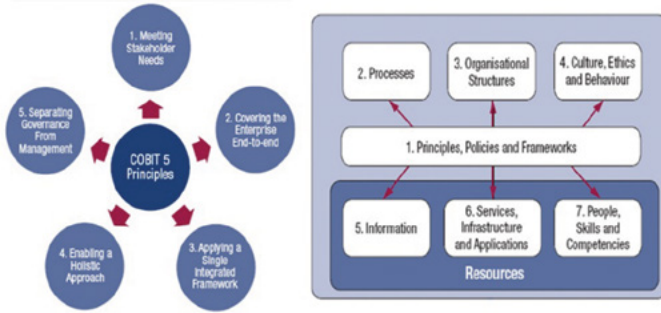


Fig-8
COBIT 5 Risk Management Framework

ERM Benefits:

It ensures higher transparency, proactive, preventive, predictive, corrective management, assure shareholders that business is well managed, strong governance, risk and compliance processes, comply with regulatory requirements, improve company rating, better financial decisions.

ERM Challenges:

There are quite a few ERM standards, the focus is more on financial side, it cannot predict black swans, internal audit focused, not integrated with ISO9001, Six Sigma, Lean Management

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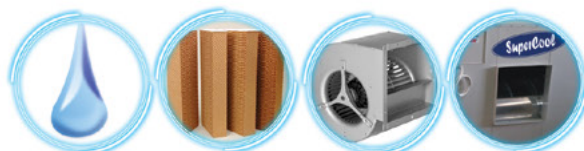
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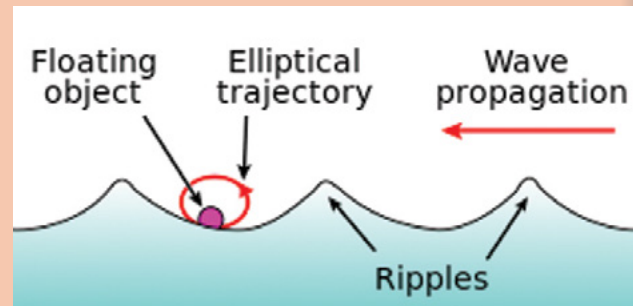


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Wave power

Wave power is the transport of energy by wind waves, and the capture of that energy to do useful work – for example, electricity generation, water desalination, or the pumping of water (into reservoirs). A machine able to exploit wave power is generally known as a wave energy converter (WEC).

Wave power is distinct from the diurnal flux of tidal power and the steady gyre of ocean currents. Wave-power generation is not currently a widely employed commercial technology, although there have been attempts to use it since at least 1890. In 2008, the first experimental wave farm was opened in Portugal, at the Aguçadoura Wave Park.¹



Waves are generated by wind passing over the surface of the sea. As long as the waves propagate slower than the wind speed just above the waves, there is an energy transfer from the wind to the waves. Both air pressure differences between the upwind and the lee side of a wave crest, as well as friction on the water surface by the wind, making the water to go into the shear stress causes the growth of the waves.

Wave height is determined by wind speed, the duration of time the wind has been blowing, fetch (the distance over which the wind excites the waves) and by the depth and topography of the seafloor (which can focus or disperse the energy of the waves). A given wind speed has a matching practical limit over which time or distance will not produce larger waves. When this limit has been reached the sea is said to be “fully developed”.

In general, larger waves are more powerful but wave power is also determined by wave speed, wavelength, and water density. Oscillatory motion is highest at the surface and diminishes exponentially with depth. However, for standing waves (clapotis) near a reflecting coast, wave energy is also present as pressure oscillations at great depth, producing microseisms.^[4] These pressure fluctuations at greater depth are too small to be interesting from the point of view of wave power.

The waves propagate on the ocean surface, and the wave energy is also transported horizontally with the group velocity. The mean transport rate of the wave energy through a vertical plane of unit width, parallel to a wave crest, is called the wave energy flux (or wave power, which must not be confused with the actual power generated by a wave power device).

Wave power devices are generally categorized by the method used to capture the energy of the waves, by location and by the power take-off system. Locations are shoreline, nearshore and offshore. Types of power take-off include: hydraulic ram, elastomeric hose pump, pump-to-shore, hydroelectric turbine, air turbine, and linear electrical generator. When evaluating wave energy as a technology type, it is important to distinguish between the four most common approaches: point absorber buoys, surface attenuators, oscillating water columns, and overtopping devices.

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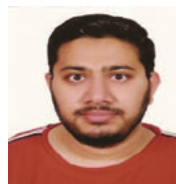
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Keep YOURSELF Motivated

- Only I can change my life. No one can do it for me. - **Carol Burnett.**
- Life is 10% what happens to you and 90% how you react to it.- **Charles R. Swindoll.**
- Our greatest weakness lies in giving up. The most certain way to succeed is always to try just one more time. - **Thomas A. Edison.**
- Optimism is the faith that leads to achievement. Nothing can be done without hope and confidence.- **Helen Keller.**
- Good, better, best. Never let it rest. 'Til your good is better and your better is best.- **St. Jerome.**
- Always do your best. What you plant now, you will harvest later.- **Og Mandino.**
- Believe in yourself! Have faith in your abilities! Without a humble but reasonable confidence in your own powers you cannot be successful or happy.- **Norman Vincent Peale.**
- Setting goals is the first step in turning the invisible into the visible. - **Tony Robbins.**
- It always seems impossible until it's done.- **Nelson Mandela.**
- With the new day comes new strength and new thoughts. - **Eleanor Roosevelt.**
- It does not matter how slowly you go as long as you do not stop. – **Confucius.**
- If you can dream it, you can do it.- **Walt Disney.**
- Quality is not an act, it is a habit. - **Aristotle.**
- The secret of getting ahead is getting started.- **Mark Twain.**
- You can't cross the sea merely by standing and staring at the water. - **Rabindranath Tagore.**
- Accept the challenges so that you can feel the exhilaration of victory. - **George S. Patton.**
- Keep your eyes on the stars, and your feet on the ground.- **Theodore Roosevelt.**

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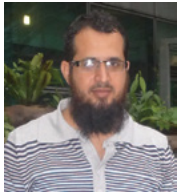
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(1) O you who have believed, do not put [yourselves] before Allah and His Messenger but fear Allah. Indeed, Allah is Hearing and Knowing.

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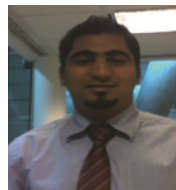
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very much closer”

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The Mathematics of Juggling

Claude Shannon has reputation as the father of information theory. He built his own robotic juggling machine programming to juggle three metal balls by bouncing them against a drum.

In the early 1980s, Shannon published the first formal mathematical theorem of juggling, correlating the length of time balls are in the air with how long each ball stays in the juggler's hand. His theorem demonstrated the importance of hand speed to successful juggling. The theory revolves around below Shannon's Equation.

$$(F+D)H=(V+D)N$$

F = how long a ball stays in the air

D = how long a ball is held in a hand

H = number of hands

V = how long a hand is empty

N = number of balls being juggled



In essence, juggling comes down to simple projectile motion, with each ball following a neat parabolic arc as it is tossed — except that there are multiple balls following interweaving paths in periodically repeating patterns. For a single juggler, there are three basic patterns: the cascade, in which an odd number of balls are tossed from one hand to the other; the fountain, in which an even number of balls are juggled in two separate columns; and the shower, in which all the balls are tossed in a circle. A more experienced juggler might throw more than one object from a single hand at the same time, a practice known as multiplexing.

There are many possible combinations of throws, so how do jugglers decide which ones will produce a valid pattern? They do so by means of a mathematical notation system called site swaps that links each ball thrown to how long it stays in the air, describing this in terms of "beats."

For example, a one-beat throw means the juggler simply passes the ball from one hand to the other. If the ball is tossed into the air, the height it reaches determines how long it takes for the ball to return to the juggler's hand — two beats, three beats, or more. The more beats, the higher the ball must be thrown to maintain the pattern. Thanks to the availability of on-line animation tools, a juggler can see what a given pattern will look like before attempting the trick in the physical world.

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Mangla Dam

The Mangla Dam is a multipurpose dam located on the Jhelum River in the Mirpur District of Jammu & Kashmir, Pakistan. It is the seventh largest dam in the world. The dam got its name from a village Mangla which was named after “Mangla Devi”, a Hindu Goddess. The project was designed and supervised by Binnie & Partners of London (the team led by partner Geoffrey Binnie), and it was built by Mangla Dam Contractors, a consortium of 8 U.S. construction firms, sponsored by Guy F. Atkinson Company of South San Francisco.

As part of the Indus Waters Treaty signed in 1960, India gained rights to the waters of the Ravi, Sutlej and Beas rivers, while Pakistan, in addition to waters of the above three rivers within Pakistan and some monetary compensation, received the rights to develop the Jhelum, Chenab and Indus river the entire irrigation system dependent on unregulated and its major tributaries. was very low for a number important being a lack of growing periods. This the seasonal variations in monsoons and the absence conserve the vast amounts those periods of high river



of Pakistan was fully ed flows of the Indus The agricultural yield of reasons, the most water during critical problem stemmed from the river flow due to of storage reservoirs to of surplus water during discharge.

The Mangla Dam was the first of the two dams constructed to reduce this shortcoming and strengthen the irrigation system of the country as part of the Indus Basin Project, the other being Tarbela Dam on River Indus.

The dam was constructed between 1961 and 1967 across the Jhelum River, about 67 miles (108 km) south-east of the Pakistani capital, Islamabad in Mirpur District of Azad Jammu & Kashmir. The Mangla Dam components include a reservoir, main embankment, intake embankment, main spillway, emergency spillway, intake structures, 5 tunnels and a power station. Besides the main dam, a dyke called Sukian – 17,000 feet in length and a small dam called Jari Dam to block the Jari Nala – about 11 miles beyond the new Mirpur town had to be constructed.

The power house, which consists of turbines, generators and transformers, has been constructed at the toe of an intake embankment at the ground surface elevation of 865 feet SPD. The water to the power house is supplied through five steel-lined tunnels of 30/26 feet diameter. Each tunnel is designed to feed two generating units. The power house tailrace discharges into New Bong Canal, which has a length of 25,000 feet with discharge capacity of about 49,000 cusecs, and terminates at an automatic gate control headworks at about 12 km downstream located near old Bong Escape Headworks.



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6. Telephone Number Office: _____ Residence: _____
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4.					
5.					
6.					
7.					
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Applicant's Signature _____

Proposer's Name (in block letters) Signature Date Class of Membership

--	--	--	--

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