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OTP on GPS: An Enhancement to OTP Security Model for Securing On-Line Transactions

Satti Sateeswara Reddy¹, M.A Prasad², V.Satish³

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Abstract: In this digital era, Online payment has become more prominent through various e-payment methods for faster and efficient way of doing business. Debit and Credit cards are used mostly for e-commerce. The major drawback here is when the transaction is under process, card owner have no control to roll back the ongoing transaction or in aborting the transaction. Online fraud is also increasing and spreading rapidly across many domains, the cyber criminals exploit various ways to find the vulnerabilities and performs the crime . This paper illustrates the on-line payment model which include the usage of credit and debit cards and discusses various threats and introduces a model to withstand the e-payment frauds. The main objective of this paper is to propose a model based on the concept of Global Positioning System (GPS) and One Time Pin (OTP) which tracks the location of the devices that participate in the transaction process.

Keywords: Payment gateway, e-commerce, cybercriminal, one time pin(OTP), global positioning system(GPS)

I. INTRODUCTION

Now a days, E-commerce is growing exponentially with the global market on internet platform and most of the online transactions are performed using a credit card or debit issued by bank, as people started adopting electronic money. Online business also started to grow in many diversified areas making a considerable surpass of general business. E-commerce made business available 24x7 with everything at our door steps from the entire globe making price comparison easier, advantage of selecting from wide range of available products, getting the reviews to know about the product pros and cons of the product, probable time of delivery and so on while saving the time to purchase something only at business hours. This will eradicate the time zone differences between the geographical areas.

Internet is widely accessible on ubiquities devices such as mobile phones which act as a participating entity in doing an online purchase. Banks started registering mobile numbers for their account holders to notify about the bank transactions made to their accounts to minimize the manual entries to bank for each and every financial operation they make. This way, banks also became a part of the internet and required to stay online round the clock.

Payment gateway act as a trusted third party between the user and the bank to secure the transaction process.

The payment gateway checks the credentials by contacting to the bank and provides the services with faster and efficient way. It is very difficult to compromise the system and because of this the merchant servers employee these systems for collecting the e-cash as they always have a strong secure mechanism.

The application on the merchant web site re-directs the user to this payment gateway once user shows the interest to pay the amount. The payment gateway once completes the transaction process in a secured way it then the user to have the merchant website to know the details. The e-commerce transaction scenario is depicted in the figure1.

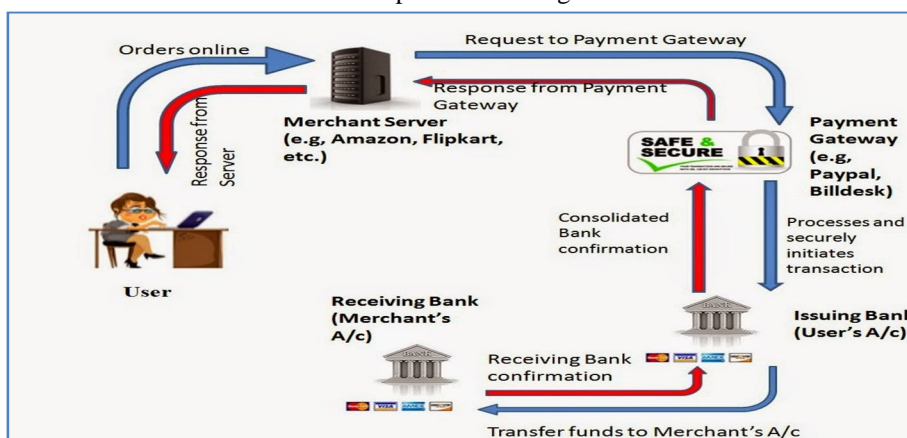


Fig.1 e-commerce transaction model[1]

Advancements in internet technology also brought new improvements in various types of cyber attacks which caused considerable financial damages, Online fraud is one among them. This paper focuses on the credit/debit card associated risks and frames a model to shield itself to such type of threats to a larger extent .

II. TYPES OF CYBER ATTACKS

A. *There are Numerous Types of Attacks Out of Them The Main Types Are Listed Below*[2][3]

- 1) *Hacking*:hacking is an act committed by an intruder by accessing your computer system without your permission
- 2) *SQL Injection*: used to attack any type of unprotected or improperly protected SQL database.
- 3) *Cross-site scripting*: also known as XSS attack, here the hacker infects a web page with a malicious client-side script or program
- 4) *Phishing*: a technique of extracting confidential information such as credit card numbers and username password combos by masquerading as a legitimate enterprise
- 5) *Cyber stalking*: Cyber stalking is a new form of internet crime in our society when a person is pursued or followed online. A cyber stalker doesn't physically follow his victim; he does it virtually by following his online activity to harvest information about the stalkee and harass him or her
- 6) *Data diddling*: Data Diddling is unauthorised altering of data before or during entry into a computer system, and then changing it back after processing is done. Using this technique, the attacker may modify the expected output and is difficult to track
- 7) *Identity Theft and Credit Card Fraud*: Identity theft occurs when someone steals your identity and pretends to be you to access resources such as credit cards, bank accounts and other benefits in your name
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- 10) *Malware*: "Malware" refers to various forms of harmful software, such as viruses and ransomware. Once malware is in your computer, it can wreak all sorts of havoc, from taking control of your machine, to monitoring your actions and keystrokes, to silently sending all sorts of confidential data from your computer or network to the attacker's home base
- 11) *Credential Reuse*: Once attackers have a collection of usernames and passwords from a breached website or service (easily acquired on any number of black market websites on the internet), they know that if they use these same credentials on other websites there's a chance they'll be able to log in and do all the damage
- 12) *Session Hijacking and Man-in-the-Middle Attacks*: The session between your computer and the remote web server is given a unique session ID, which should stay private between the two parties; however, an attacker can hijack the session by capturing the session ID and posing as the computer making a request, allowing them to log in as an unsuspecting user and gain access to unauthorized information on the web server
- 13) *Telecommunication Attack*: is an emerging attack where a user gets a call from the attacker imposing himself as a bank employee and asks all the sensitive data which will be necessary to steal some money from your account
- 14) *Application Attack*: makes you to fill the data as if you are registering to any of the website and gains your personal data such as passwords for e-mails, credit card or debit card information and etc

III.ONE TIME PIN (OTP) SYSTEM

To overcome the financial frauds associated with the credit/debit cards this OTP system is being adopted, where your registered mobile is going to receive the OTP from the payment gateway whenever you want to do any online transaction. The OTP that you receive is time bounded i.e, you need to send the OTP back to the payment gate way to authenticate yourself as an authorized account holder to complete the ongoing transaction. The steps are given below

- A. *Step 1*: User order's online through the merchant's website to the merchant server.
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- C. Step 2: Payment gateway prompts for your debit/credit card details through merchant server.
- D. Step 3: User enters the details asked for and send to the payment gateway
- E. Step 4: Payment gateway send the details to the associated bank to verify the account validity.
- F. Step 5: If details are verified bank will send the positive response else will deny the existence of account.
- G. Step 6: Then the payment gateway will send the four digits as OTP to the user's mobile which is registered with the bank for re-verification.
- H. Step 7: The user receives the OTP and enters it on the payment gateway web page.
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The major drawback in the OTP system is that the user will receive a message about the amount deduction and asks to complain about it if it wasn't made by him.

There are various complaints filed in the OTP system as telecommunication fraud is closely associated with this system, where once OTP is generated some one pretends to be a bank employee asks for the OTP and performs the false financial transaction .

The man in the middle attack is also closely related to it, if the users mobile is compromised then the copy of the OTP is received by the cyber criminal along with the legitimate user and the stealing of money will be done.

The attacks not only exploit the wealth but also makes a huge loss to the credibility of merchants web site as well as the trusted payment gateway leading to decrease in the transaction through it.

To overcome, this type of attack a model OTP On GPS is proposed to maintain a good relationship between the authenticated users and the merchants.

IV. OTP ON GPS MODEL

Global Positioning System(GPS) is a navigation system that uses satellites to determine the approximate location of someone or some device anywhere on the planet where a cell phone signal is available.

This GPS is used in this model which is a refinement to the existing OTP model where in addition to the OTP details, the payment gateway also checks the location of the device which has placed the order as well as the registered mobile location which received the OTP to cross verify the identity of the user.

The Proposed model makes use of three variables, fixes it to some value. x ,used to store the ordering device location.

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When, the difference between x and y is less than the threshold value then the probability of fraud is less. If the difference between x and y is than the threshold then there is a probability of threat and is verified by communicating directly with the user whether he has initiated the transaction or not.

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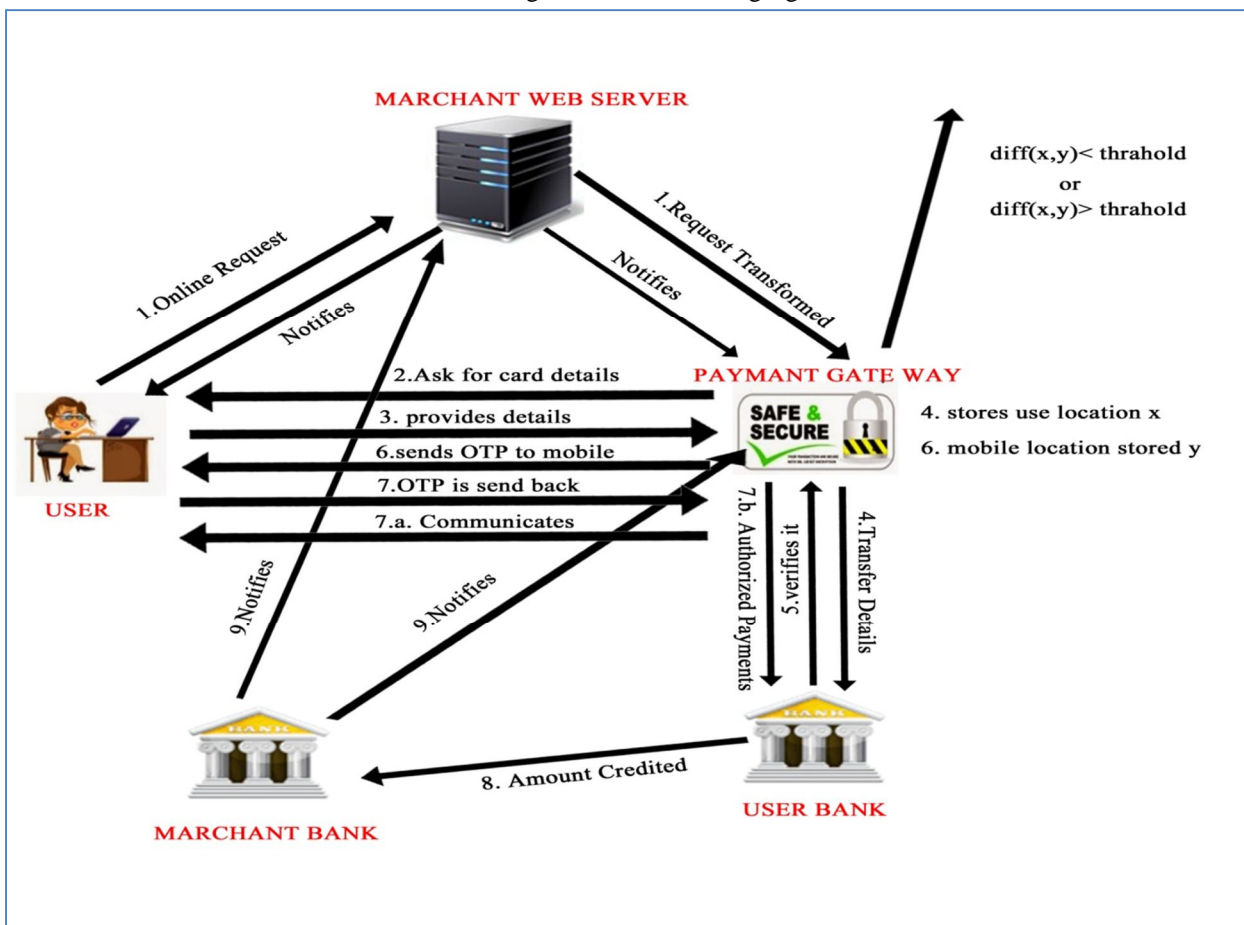


Fig.2 OTP on GPS Model

Note: The threshold value should be taken in such a way that it should give accurate results.

V. CONCLUSION

The Cyber attacks are evolving day by day and there are no means to stop them the only way to deal with them is to anticipate the affect and deal with them such that the loss is minimal. The proposed OTP on GPS model works well in reducing the online frauds compared to the existing model. This works as a fraud anticipation model, the disadvantage here is the devices which are used in the transaction should have the GPS option, if there is no such option there is a least possibility to find the accurate location of the device. Moreover, this model can be enhanced to more secured way if the mobile device has a bio-metric option to check the finger print of the user. The on line frauds can only be reduced if the users have some basic knowledge of the transactions which could be done by the merchants and the banks periodically if some change occurs in technology or a new feature is added in verification process.

REFERENCES

- [1] <http://www.netvuze.com/2014/05/how-to-cope-up-with-online-transactions.html>.
- [2] <https://www.rapid7.com/fundamentals/types-of-attacks/>
- [3] <https://www.digit.in/technology-guides/fasttrack-to-cyber-crime/the-12-types-of-cyber-crime.html>
- [4] Ishu Trivedi , Monika , Mrigya Mridushi," Credit Card Fraud Detection", International Journal of Advanced Research in Computer and Communication Engineering Vol. 5, Issue 1, January 2016
- [5] Priya Ravindra Shimpi, Prof. Vijayalaxmi Kadroli," Survey on Credit Card Fraud Detection Techniques", International Journal Of Engineering And Computer Science ISSN: 2319-7242 Volume 4 Issue 11 Nov 2015, Page No. 15010-15015
- [6] Tej Paul Bhatla, Vikram Prabhu & Amit Dua,"Understanding Credit Card Frauds", Cards Business Review#2003-01



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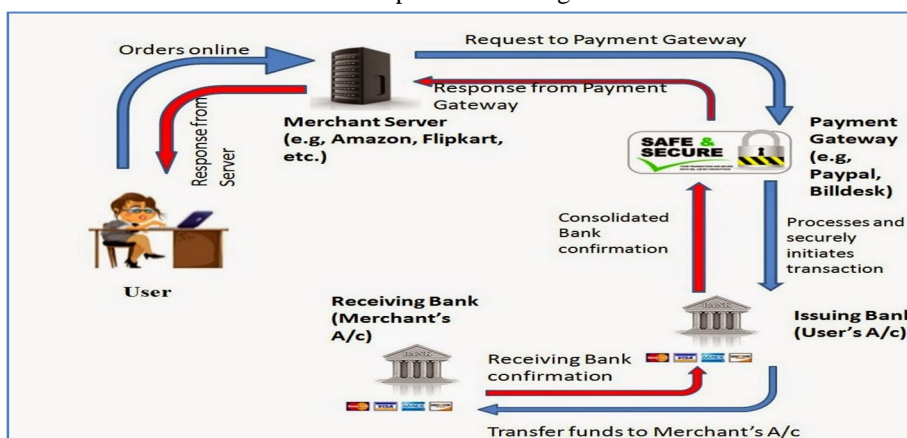


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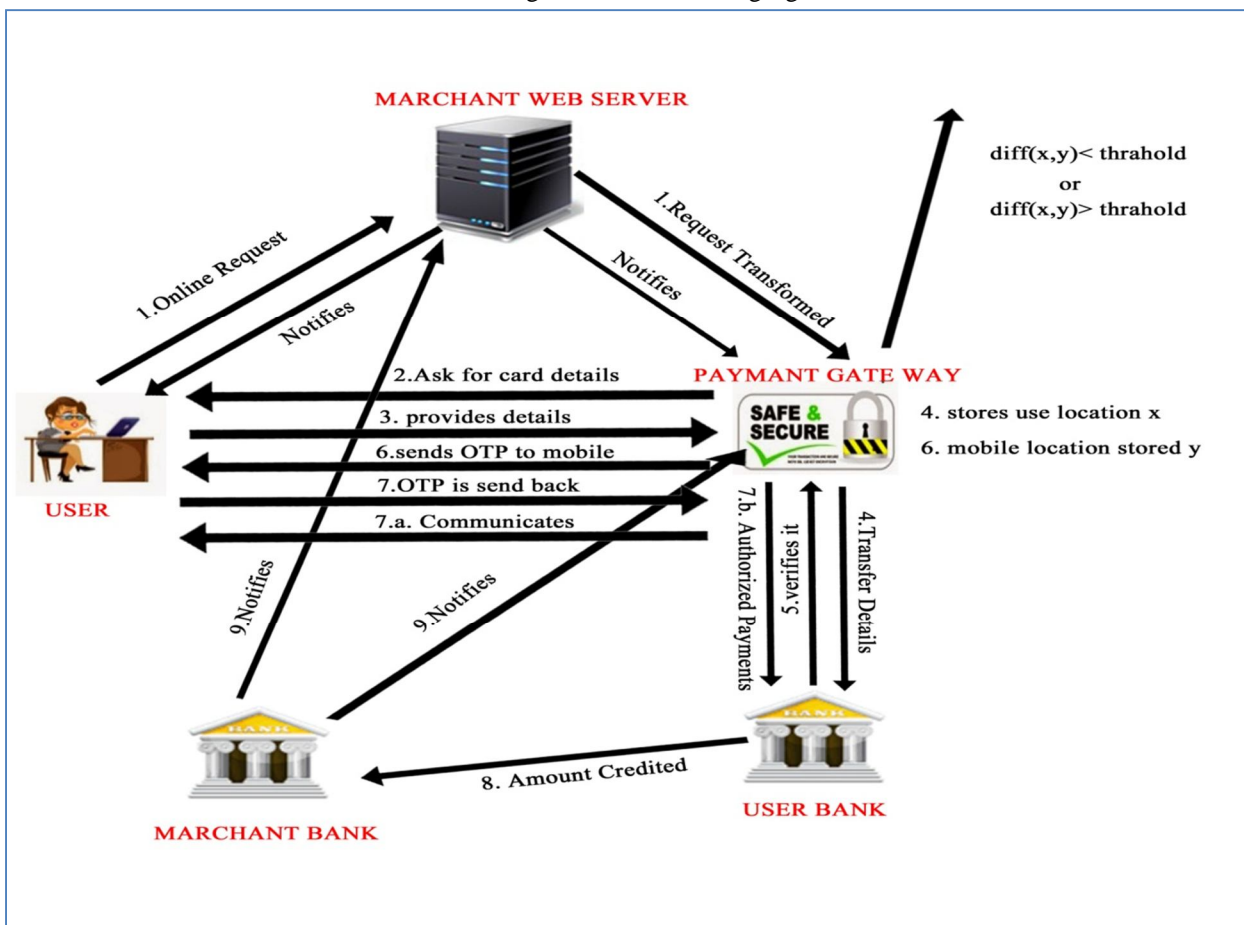


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REFERENCES

- [1] <http://www.netvuze.com/2014/05/how-to-cope-up-with-online-transactions.html>.
- [2] <https://www.rapid7.com/fundamentals/types-of-attacks/>
- [3] <https://www.digit.in/technology-guides/fasttrack-to-cyber-crime/the-12-types-of-cyber-crime.html>
- [4] Ishu Trivedi , Monika , Mrigya Mridushi," Credit Card Fraud Detection", International Journal of Advanced Research in Computer and Communication Engineering Vol. 5, Issue 1, January 2016
- [5] Priya Ravindra Shimpi, Prof. Vijayalaxmi Kadroli," Survey on Credit Card Fraud Detection Techniques", International Journal Of Engineering And Computer Science ISSN: 2319-7242 Volume 4 Issue 11 Nov 2015, Page No. 15010-15015
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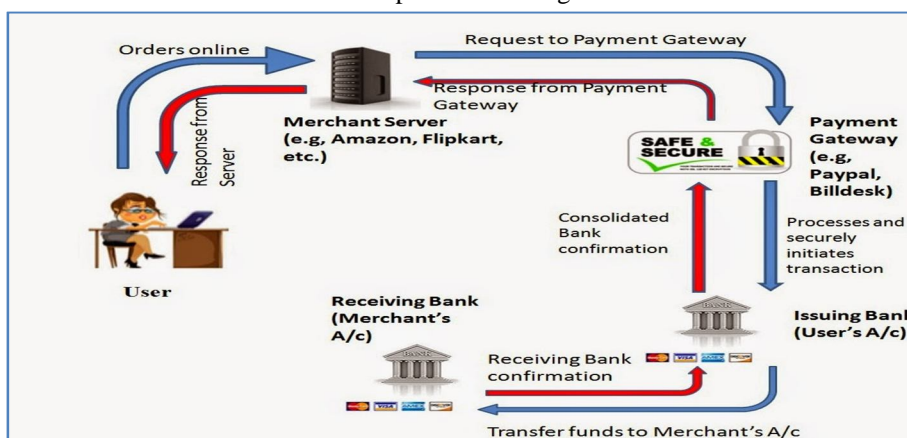


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- 5) *Cyber stalking*: Cyber stalking is a new form of internet crime in our society when a person is pursued or followed online. A cyber stalker doesn't physically follow his victim; he does it virtually by following his online activity to harvest information about the stalkee and harass him or her
- 6) *Data diddling*: Data Diddling is unauthorised altering of data before or during entry into a computer system, and then changing it back after processing is done. Using this technique, the attacker may modify the expected output and is difficult to track
- 7) *Identity Theft and Credit Card Fraud*: Identity theft occurs when someone steals your identity and pretends to be you to access resources such as credit cards, bank accounts and other benefits in your name
- 8) *Salami attack*: is a technique by which cyber-criminals steal money or resources a bit at a time so that there's no noticeable difference in overall siz
- 9) *Denial of Service attacks*: They're carried out by opening many connections to your computer and leaving them open; this consumes plenty of resources on your computer and can crash it
- 10) *Malware*: "Malware" refers to various forms of harmful software, such as viruses and ransomware. Once malware is in your computer, it can wreak all sorts of havoc, from taking control of your machine, to monitoring your actions and keystrokes, to silently sending all sorts of confidential data from your computer or network to the attacker's home base
- 11) *Credential Reuse*: Once attackers have a collection of usernames and passwords from a breached website or service (easily acquired on any number of black market websites on the internet), they know that if they use these same credentials on other websites there's a chance they'll be able to log in and do all the damage
- 12) *Session Hijacking and Man-in-the-Middle Attacks*: The session between your computer and the remote web server is given a unique session ID, which should stay private between the two parties; however, an attacker can hijack the session by capturing the session ID and posing as the computer making a request, allowing them to log in as an unsuspecting user and gain access to unauthorized information on the web server
- 13) *Telecommunication Attack*: is an emerging attack where a user gets a call from the attacker imposing himself as a bank employee and asks all the sensitive data which will be necessary to steal some money from your account
- 14) *Application Attack*: makes you to fill the data as if you are registering to any of the website and gains your personal data such as passwords for e-mails, credit card or debit card information and etc

III.ONE TIME PIN (OTP) SYSTEM

To overcome the financial frauds associated with the credit/debit cards this OTP system is being adopted, where your registered mobile is going to receive the OTP from the payment gateway whenever you want to do any online transaction. The OTP that you receive is time bounded i.e, you need to send the OTP back to the payment gate way to authenticate yourself as an authorized account holder to complete the ongoing transaction. The steps are given below

- A. *Step 1*: User order's online through the merchant's website to the merchant server.
- B. *Step 2*: Merchant server send the request to payment gateway

- C. Step 2: Payment gateway prompts for your debit/credit card details through merchant server.
- D. Step 3: User enters the details asked for and send to the payment gateway
- E. Step 4: Payment gateway send the details to the associated bank to verify the account validity.
- F. Step 5: If details are verified bank will send the positive response else will deny the existence of account.
- G. Step 6: Then the payment gateway will send the four digits as OTP to the user's mobile which is registered with the bank for re-verification.
- H. Step 7: The user receives the OTP and enters it on the payment gateway web page.
- I. Step 8: The gateway verifies the OTP if it is correct, it will notify the bank to credit the amount to the merchant's account or if the credentials are wrong it will abort the transaction.
- J. Step 9: Bank will check the account balance if sufficient funds are available it will grant the request and credit the amount in merchants account which was verified by the payment gateway or if the funds are less the same is informed to payment gateway
- K. Step 10: If the payment is successful it is informed to the user or the insufficient funds message is sent.

The major drawback in the OTP system is that the user will receive a message about the amount deduction and asks to complain about it if it wasn't made by him.

There are various complaints filed in the OTP system as telecommunication fraud is closely associated with this system, where once OTP is generated some one pretends to be a bank employee asks for the OTP and performs the false financial transaction .

The man in the middle attack is also closely related to it, if the users mobile is compromised then the copy of the OTP is received by the cyber criminal along with the legitimate user and the stealing of money will be done.

The attacks not only exploit the wealth but also makes a huge loss to the credibility of merchants web site as well as the trusted payment gateway leading to decrease in the transaction through it.

To overcome, this type of attack a model OTP On GPS is proposed to maintain a good relationship between the authenticated users and the merchants.

IV. OTP ON GPS MODEL

Global Positioning System(GPS) is a navigation system that uses satellites to determine the approximate location of someone or some device anywhere on the planet where a cell phone signal is available.

This GPS is used in this model which is a refinement to the existing OTP model where in addition to the OTP details, the payment gateway also checks the location of the device which has placed the order as well as the registered mobile location which received the OTP to cross verify the identity of the user.

The Proposed model makes use of three variables, fixes it to some value. x ,used to store the ordering device location. y , used to store the registered mobile location

When, the difference between x and y is less than the threshold value then the probability of fraud is less. If the difference between x and y is than the threshold then there is a probability of threat and is verified by communicating directly with the user whether he has initiated the transaction or not.

The difference between OTP and OTP on GPS change as illustrated below:

Step 1: user order's online through the website to the payment gate way.

step 2: payment gateway prompts for your debit/credit card details and stores the users device location in ' x '

Step 3: user enters the details asked for and send to the payment gateway

Step 4: payment gateway send the details to the associated bank to verify the account validity.

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Step 6: then the payment gateway will send the four digits as otp to the user's mobile which is registered with the bank for re-verification and also store's the mobile location in ' y '.

Step 7: the user receives the otp and enters it on the payment gateway web page.

Step 8: the gateway verifies otp and if $\text{diff}(x,y) < \text{threshold}$ it will notify the bank to credit the amount the merchant's account or if otp and if $\text{diff}(x,y) > \text{threshold}$ then communicate to user and allow or abort the process or if the otp is wrong it will abort the transaction.

Step 9: bank will check the account balance if sufficient funds are available it will grant the request and credit the amount in merchants account which was verified by the payment gateway

The entire model is given in the following figure2.

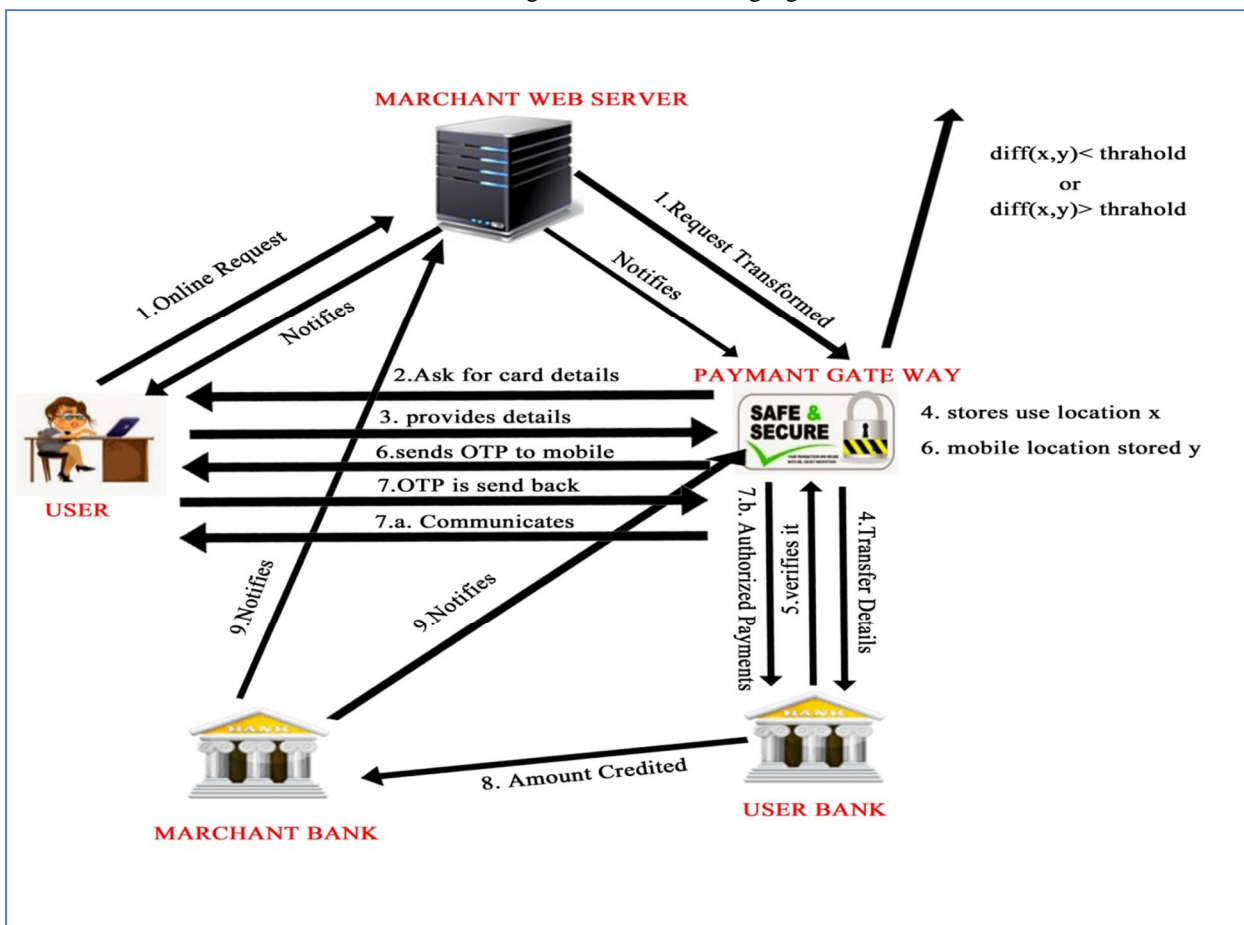


Fig.2 OTP on GPS Model

Note: The threshold value should be taken in such a way that it should give accurate results.

V. CONCLUSION

The Cyber attacks are evolving day by day and there are no means to stop them the only way to deal with them is to anticipate the affect and deal with them such that the loss is minimal. The proposed OTP on GPS model works well in reducing the online frauds compared to the existing model. This works as a fraud anticipation model, the disadvantage here is the devices which are used in the transaction should have the GPS option, if there is no such option there is a least possibility to find the accurate location of the device. Moreover, this model can be enhanced to more secured way if the mobile device has a bio-metric option to check the finger print of the user. The on line frauds can only be reduced if the users have some basic knowledge of the transactions which could be done by the merchants and the banks periodically if some change occurs in technology or a new feature is added in verification process.

REFERENCES

- [1] <http://www.netvuze.com/2014/05/how-to-cope-up-with-online-transactions.html>.
- [2] <https://www.rapid7.com/fundamentals/types-of-attacks/>
- [3] <https://www.digit.in/technology-guides/fasttrack-to-cyber-crime/the-12-types-of-cyber-crime.html>
- [4] Ishu Trivedi , Monika , Mrigya Mridushi," Credit Card Fraud Detection", International Journal of Advanced Research in Computer and Communication Engineering Vol. 5, Issue 1, January 2016
- [5] Priya Ravindra Shimpi, Prof. Vijayalaxmi Kadroli," Survey on Credit Card Fraud Detection Techniques", International Journal Of Engineering And Computer Science ISSN: 2319-7242 Volume 4 Issue 11 Nov 2015, Page No. 15010-15015
- [6] Tej Paul Bhatla, Vikram Prabhu & Amit Dua,"Understanding Credit Card Frauds", Cards Business Review#2003-01



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Impact of Big-Data on Education System

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Keywords: *Big Data, LMS, Educational Data Mining, Learning Analytics.*

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Due to the progression of technology modern conventional approaches are adopted by educational institutions in teaching and learning. The higher education sectors are increasingly getting technology centric. Educational institutions need to gaze for tools and techniques for data acquisition, storage, analysis and decision making. The huge amount of students' data in the institutions can be considered as big data. Big Data refers to the large volume of the data as well as the technology and tools used to processes and analyze data into usable information. Academic institutions should make use of advanced technologies to yield the benefits from this huge amount of data.

Educational institutions need to record all academic related data from various activities such as students' data, tutor data, courses data, registration data, assessment data etc. Due to the advancement of information technology social communications have increasingly moved to online.

The online communications can be traced and collected and will form a huge amount of data and can be considered as big data. Thus data collection and analysis have become a challenging task in higher education sectors. Most of the higher education sectors lack proper IT infrastructure, tools as well as human expertise required for effective data collection, analysis and visualization. While collecting and analyzing student data, educational institutions face some challenges like privacy, safety, and security issues[3].

II. BIG DATA

"Big Data" refers to any set of data [4] that is so large or so complex that conventional applications are not adequate to process them. The term also refers to the tools and technologies used to handle "Big Data". Examples of Big Data include the amount of data shared in the internet everyday, YouTube videos viewed, twitter feeds and mobile phone location data. The Big Data trend has impacted all industries, including the education sectors as new technologies are being developed to automate and simplify the process of data analysis and prediction of results [5]. In the recent years, data produced by learning environments have also started to get big enough raising the need for Big Data technologies and tools to handle them. The specific attributes that define big data are called the four V's: volume, variety, velocity, and veracity.

A. Volume

In the context of big data volume is considered as one of the characteristics because of the fact that large volumes of structured and unstructured data are collected and analyzed in organizations from various sources[2]. Data is generated by human interaction through social networks, data from M2M technology and enterprise systems processes and reports.

B. Variety

Data is available from various sources and various types such as relational data such as tables, transaction, legacy data available from Data Base Management Systems, Text Data from Web sources, XML data availability from online sources and database environment can be considered as semi-structured data, data from social networks, streaming data etc.

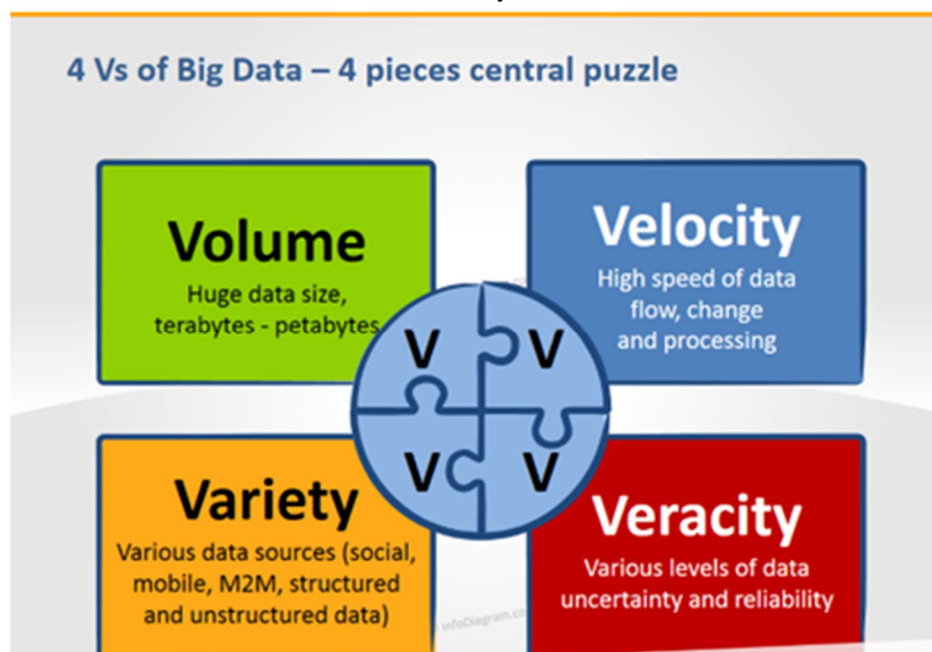
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D. Veracity

The collected data in organizations must meet the quality standards and produce accurate results which will lead to proper action especially in critical decision making. By implementing data validation managerial levels as well as the operational level employees can trust the organizational data and can be used for successful analytics.



E. Techniques

The most popular techniques used in educational data mining are

- 1) *Regression* - Regression is used in predicting values of a dependant variable by estimating the relationship among variables using statistical analysis.
- 2) *Nearest Neighbour* - In this technique the values are predicted based on the predicted values of the records that are nearest to the record that needs to be predicted.
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F. Open Source Tools

Several Open source tools exist which help in taming Big Data [6]. Some of the top tools are

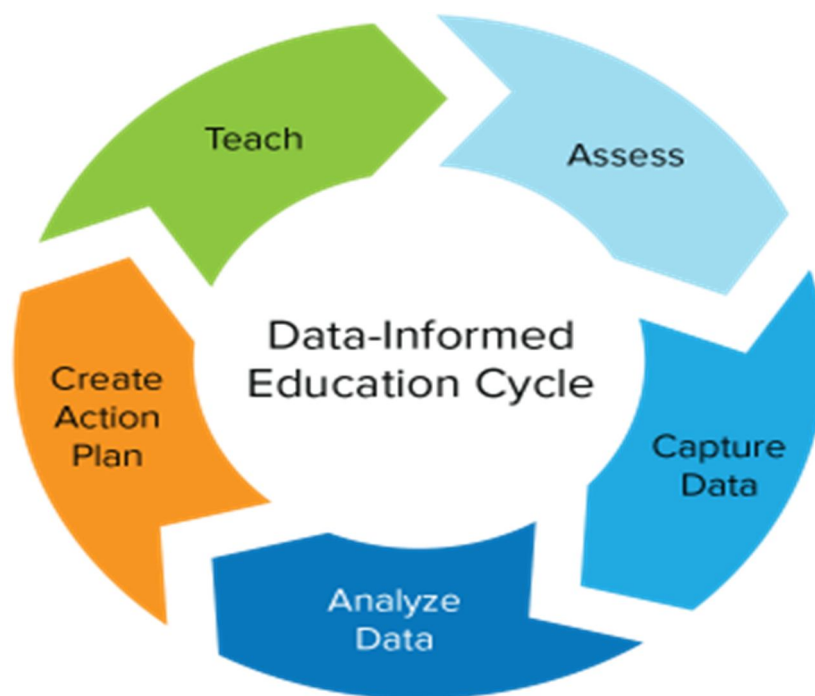
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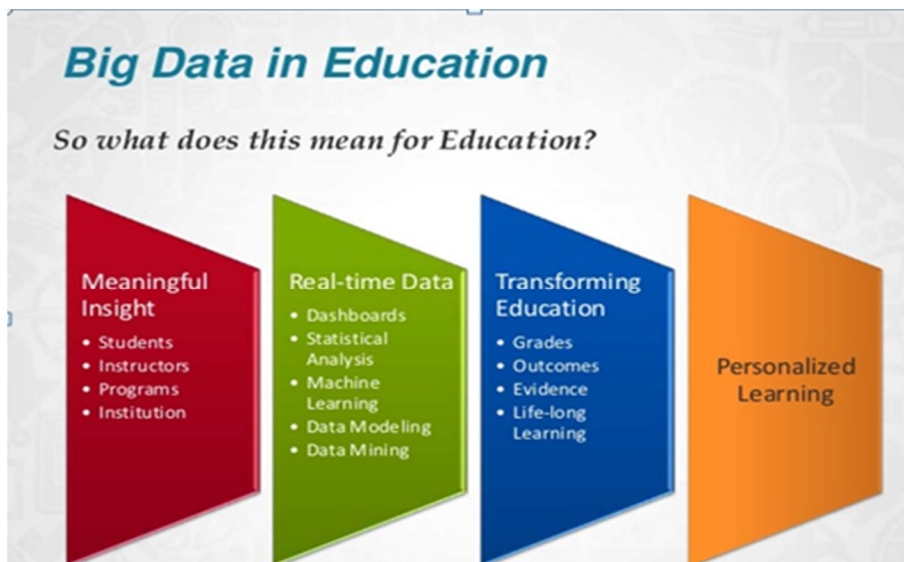
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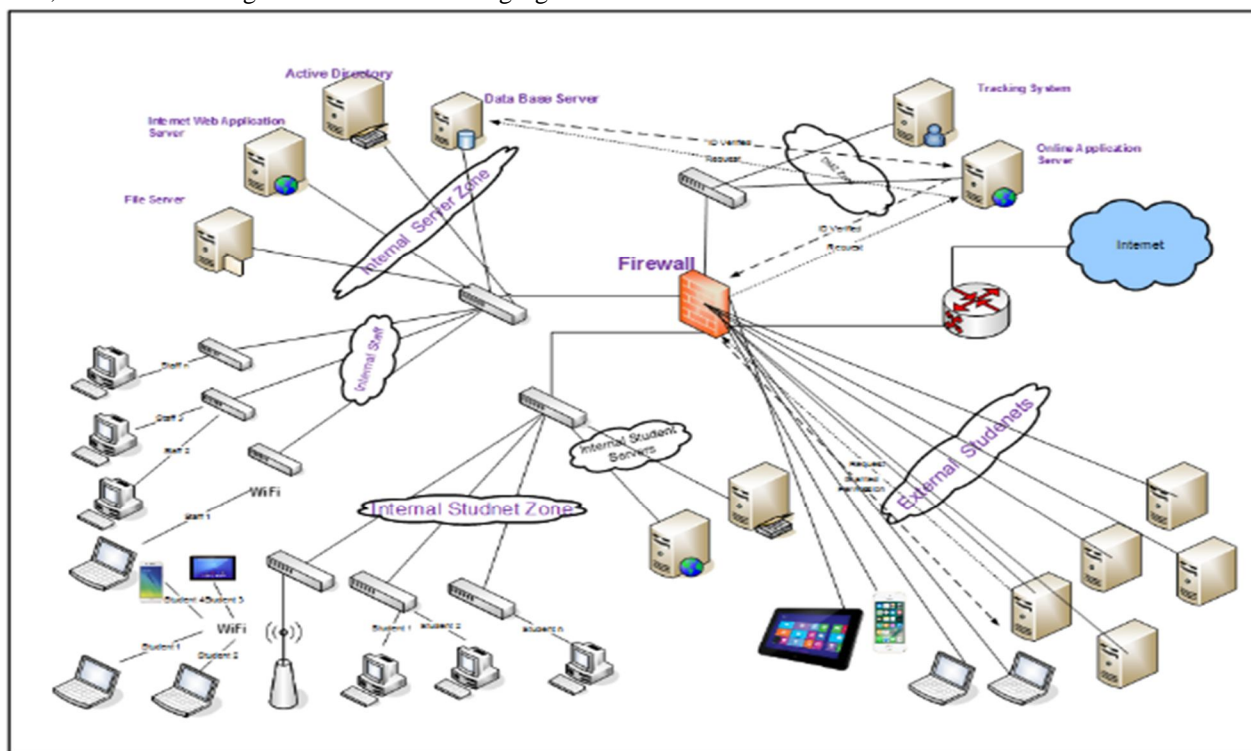
Big Data techniques can be used in a variety of ways in learning analytics as listed below.

- 1) *Feat Prediction* : Student's performance can be predicted by analyzing student's interaction in a learning environment with other students and teachers
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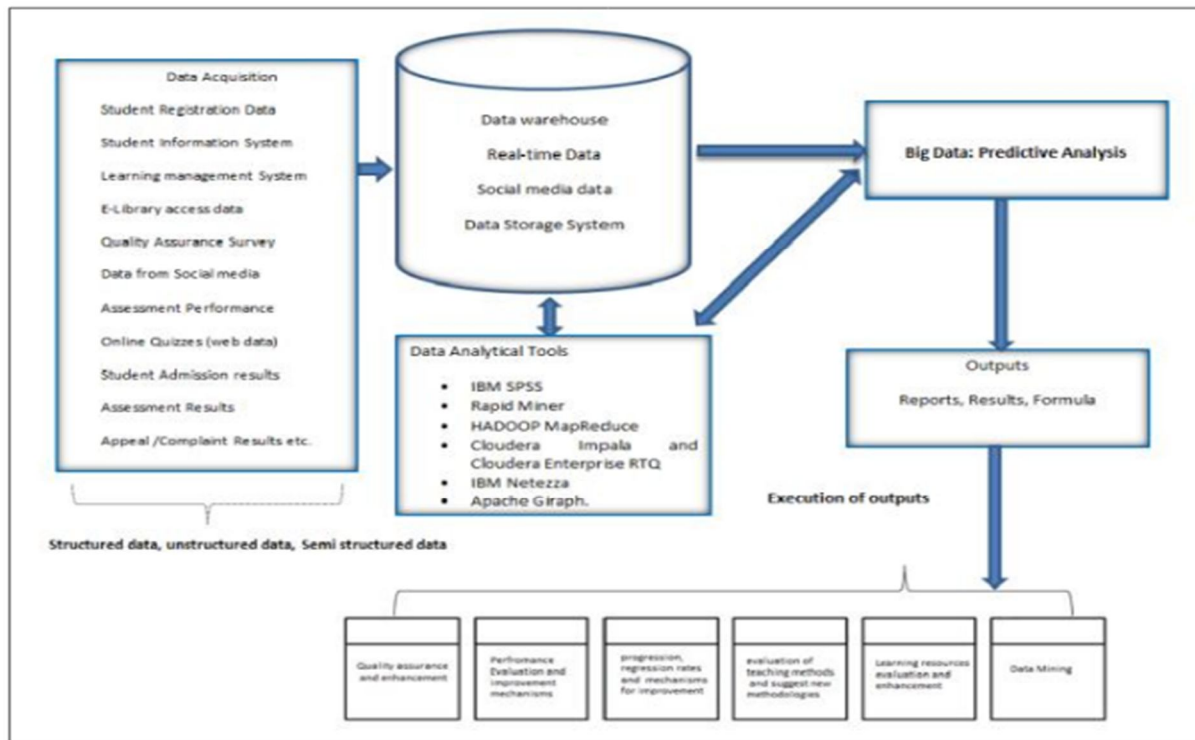
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Data analytical tools can be used to analyze the stored data. For rapidly growing datasets, there can be a need to analyze data as it arrives to get the maximum value due to its time sensitivity. Lastly, the validity of the data needs to be considered whether the derived information from the analysis can be trusted [9].

IV. CONCLUSION

The proper use of big data analytics could accomplish the radical development on the education sector. Bigdata analytics can signify customized learning environments to the learners, can reduce potential dropouts and can develop long term learning plans. All these are possible through the effective development and use of big data analytics in the educational institutions. Institutions should recognize suitable big data analytics tool to yield the benefits from the huge amount of data , to take decisions and drive the institution towards benefiting from the data.

REFERENCES

- [1] Minimol Anil Job “An Efficient Way of Applying Big Data Analytics in Higher Education sector for Performance Evaluation” International Journal of Computer Applications Volume 180-No.23
- [2] S.Lohr, “The age of big data,” New York Times, vol. 11, 2012
- [3] Kaisler, S., Armour, F., Espinosa, J. A., & Money, W. (2013). Big Data: Issues and challenges Moving Forward.
- [4] Wikipedia, “Big data Wikipedia, The Free encyclopedia”, https://en.wikipedia.org/w/index.php?title=Big_data&oldid=669888993. Accessed 2015.
- [5] System Sciences (HICSS), 2013 46th Hawaii International Conference on (pp. 995-004).<http://dx.doi.org/10.1109/HICSS.2013.645>
- [6] Cynthia Harvey, “50 Top Open Source Tools for Big Data”, Accessed 2012
- [7] Bill Tucker, “The flipped classroom”, Education Next , Vol. 12, No. 1, pp. 82-83, 2012.
- [8] Shriram Raghunathan and Abtar Kaur, “Assessment of online interaction pattern using the Q-4R framework”, The International Lifelong Learning Conference, 2011.
- [9] T. Erl, W. Khattak, P. Buhler, Big Data Fundamentals: Concepts, Drivers & Techniques, Boston: Prentice Hall, 2016.



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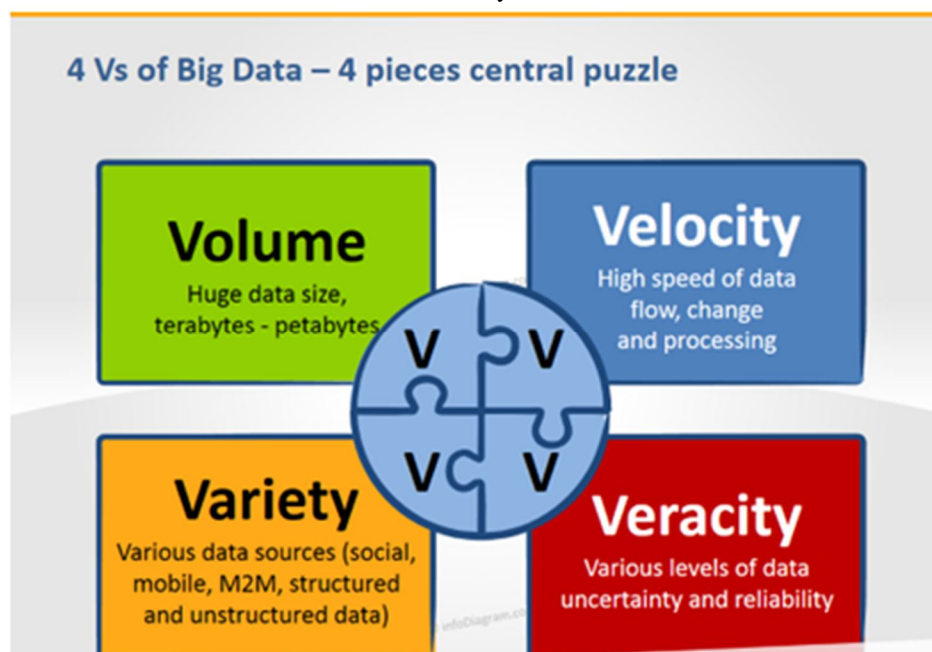
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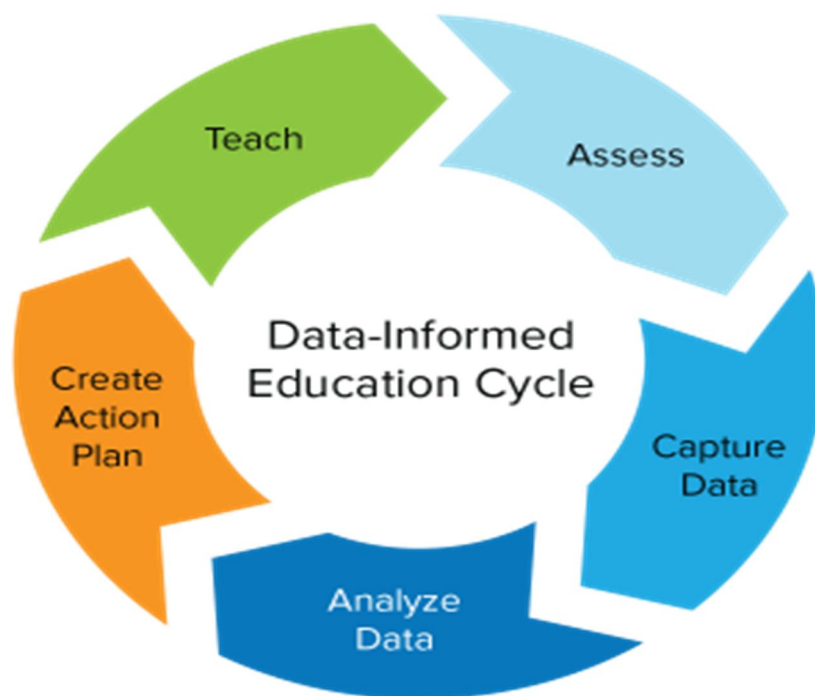
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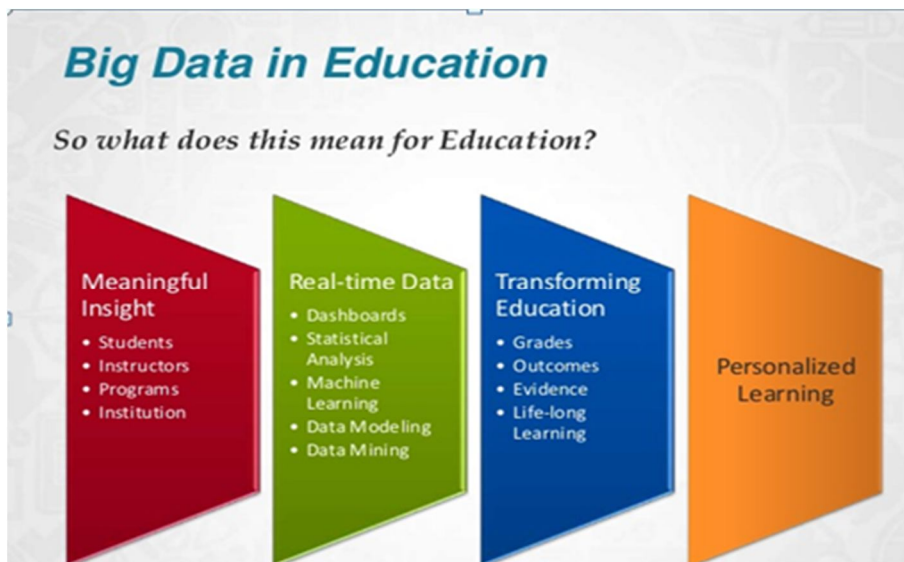
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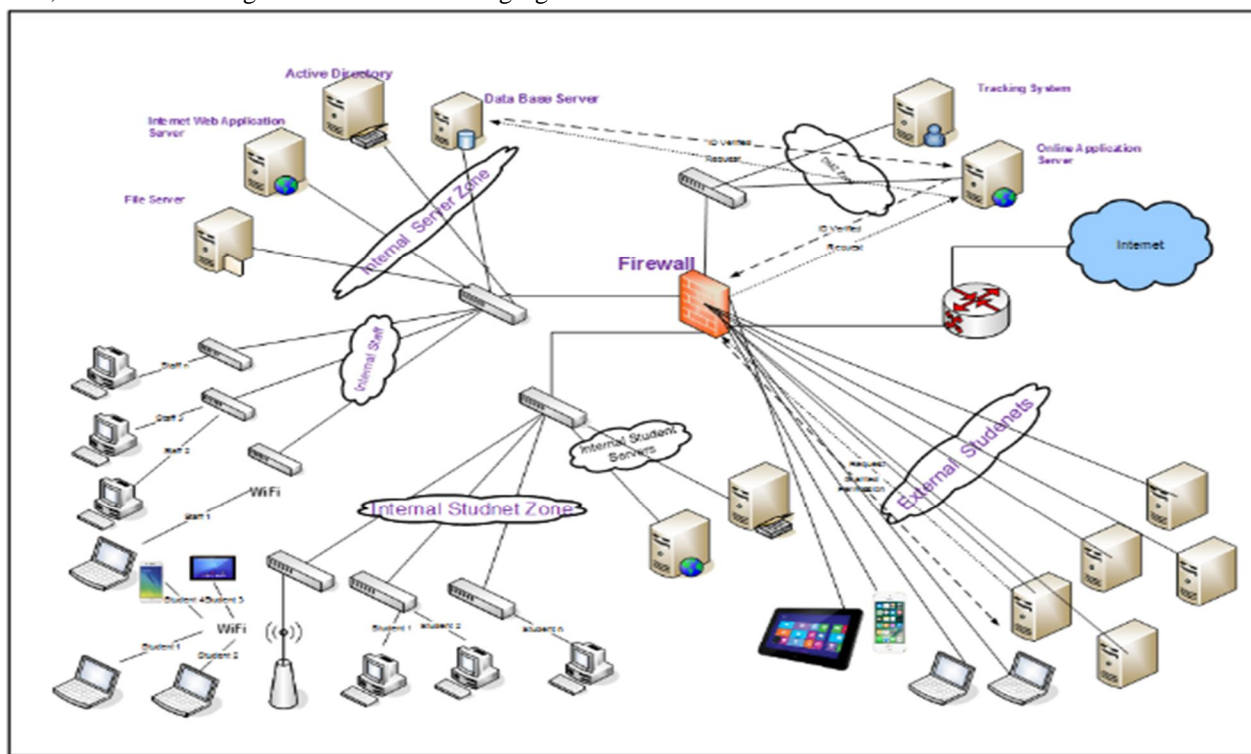
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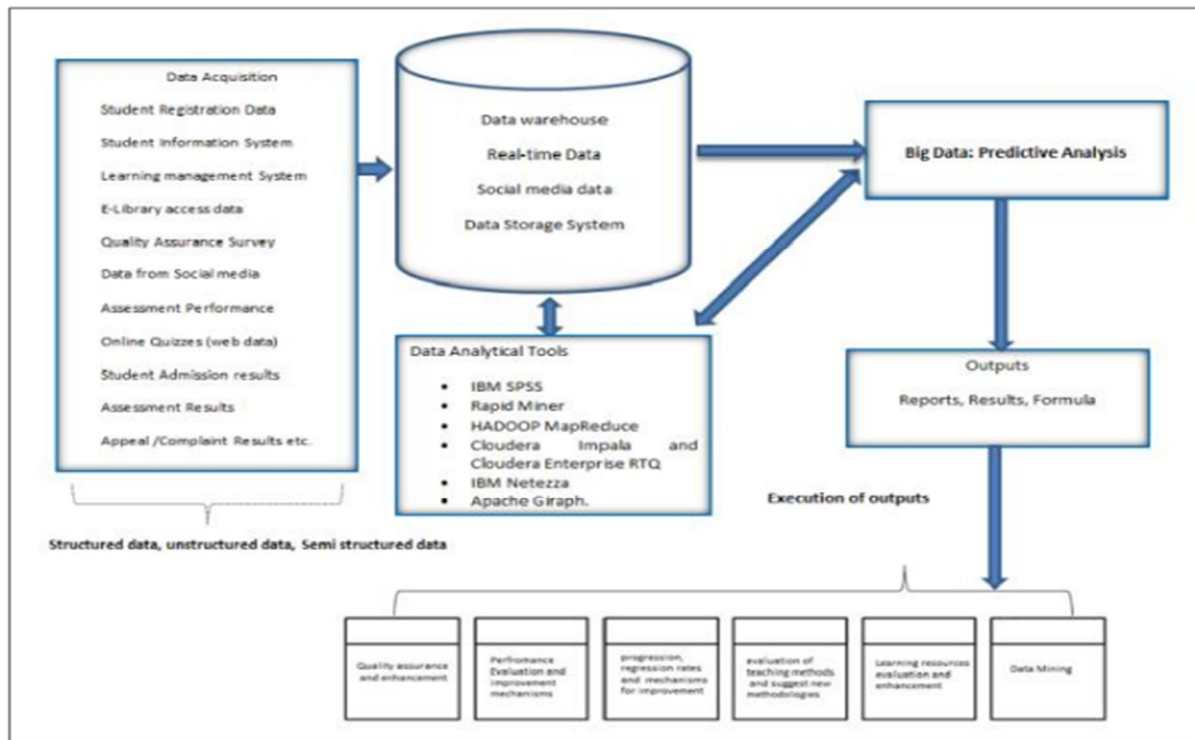
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The information technology architecture shows the server confirmation, networks and various types of internal users and external students. The data is accessed and communications are through personal computers, laptops or mobile devices. In the suggested big data architecture, information management shows the data collection, storage, retrieval of data, analysis and output generation life

cycle. Various information systems are used in higher education institutions. Learning Management systems (LMS) is used for learning and teaching, Student Information System used for registration of courses, online payment etc. There are systems designed with mobile interfaces also. The collected data can be in the form of structured, semi structured or unstructured data. The collected data will be stored using appropriate data storage mechanisms. The collected huge data will be stored as real time data for immediate processing and results and historical data will be stored in data warehouses for future uses.



Data analytical tools can be used to analyze the stored data. For rapidly growing datasets, there can be a need to analyze data as it arrives to get the maximum value due to its time sensitivity. Lastly, the validity of the data needs to be considered whether the derived information from the analysis can be trusted [9].

IV. CONCLUSION

The proper use of big data analytics could accomplish the radical development on the education sector. Bigdata analytics can signify customized learning environments to the learners, can reduce potential dropouts and can develop long term learning plans. All these are possible through the effective development and use of big data analytics in the educational institutions. Institutions should recognize suitable big data analytics tool to yield the benefits from the huge amount of data , to take decisions and drive the institution towards benefiting from the data.

REFERENCES

- [1] Minimol Anil Job “An Efficient Way of Applying Big Data Analytics in Higher Education sector for Performance Evaluation” International Journal of Computer Applications Volume 180-No.23
- [2] S.Lohr, “The age of big data,” New York Times, vol. 11, 2012
- [3] Kaisler, S., Armour, F., Espinosa, J. A., & Money, W. (2013). Big Data: Issues and challenges Moving Forward.
- [4] Wikipedia, “Big data Wikipedia, The Free encyclopedia”, https://en.wikipedia.org/w/index.php?title=Big_data&oldid=669888993. Accessed 2015.
- [5] System Sciences (HICSS), 2013 46th Hawaii International Conference on (pp. 995-004).<http://dx.doi.org/10.1109/HICSS.2013.645>
- [6] Cynthia Harvey, “50 Top Open Source Tools for Big Data”, Accessed 2012
- [7] Bill Tucker, “The flipped classroom”, Education Next , Vol. 12, No. 1, pp. 82-83, 2012.
- [8] Shriram Raghunathan and Abtar Kaur, “Assessment of online interaction pattern using the Q-4R framework”, The International Lifelong Learning Conference, 2011.
- [9] T. Erl, W. Khattak, P. Buhler, Big Data Fundamentals: Concepts, Drivers & Techniques, Boston: Prentice Hall, 2016.



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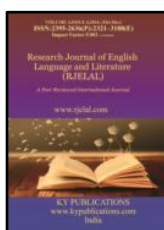
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**IDENTITY AND INITIATION – A STRUGGLE
A COMPARITIVE STUDY OF STEPHEN CRANES'S *THE RED BADGE OF COURAGE* AND
THEODORE DREISER'S *AN AMERICAN TRAGEDY***

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ABSTRACT

Struggle and Survival are inseparable phases of every civilization and every human life. Civil War, Evolutionary Sciences have deeply influenced American society. The struggle for existence and the survival of the fittest pushed the new generation from its roseate dream into harsh reality. The conflict between the religious creeds, social situations and the impact of the American Dream of Success have caused the writers to present their characters engaged in a struggle to fit in and survive. Against this backdrop, comes a literary movement, Naturalism questioning the divine nature of man and shattering the idealism of transcendentalism. It aims to present life as it is. To this genre belongs Stephen Crane and Theodore Dreiser who themselves are the products of intellectual and spiritual unrest.

The re-reading of the works of Crane and Dreiser highlights their identity and initiation crises experienced by the young generation, holding the mirror to the never fading many faces of struggle. This article attempts to focus on the quest for identity and the struggle to get initiated, the survival and self-destruction of the protagonists of Crane and Dreiser set in war backdrop and glamour and glitz of the materialistic American society.

Key Words: identity, initiation, struggle, survival, battling community, materialism

Struggle and survival are inseparable phases of every civilization and every human life. During the decades that followed the civil war, swiftly moving changes have reshaped America. The impact of theories of evolutionary sciences, especially Darwinism and Spencerian concept, on American society and culture is tremendous. These theories have given a new impetus to Naturalism, a literary movement aimed at presenting life as it is. The divine nature of man is questioned and romanticism and idealism of transcendentalists are forgotten.

The intellectual climate of America with its post-war problems, industrial and agrarian issues

and evolutionary doctrine have favoured a realistic outlook. To this new generation life is no roseate dream but hard every day struggle for existence and survival of the fittest.

Stephen Crane (1871-1900) and Theodore Dreiser (1872-1945) are the products of intellectual and spiritual unrest. The conflict between their religious creeds, social situations and their human values is reflected in their works.

The re-reading of the works of Crane and Dreiser highlights the Gramscian Hegemony in their social circles which defend Patriarchal family and Protestant fundamentalism. Crane's *The Red Badge*

of Courage and Dreiser's An American Tragedy incorporate "Hegemonic Masculinity".

Stephen Crane's *The Red Badge of Courage*, is a literary triumph in Naturalism. It contains various struggles both within the man and around him. Man in his struggle for identity has the most formidable foe – fear. The quest for identity and initiation in the society are shadowed by the inner struggle of man. Hence, Crane calls this novel 'Psychological Portrayal of Fear'. The protagonist is controlled by the determined forces beyond his control.

Henry Fleming joins the army despite his mother's discouragement in the hope of fighting Homeric battles and Titanic troubles. His dreams of the glories of the war are shattered by the realities he faces in the actual battle field. When his regiment marches into battle, Henry sees that he is trapped and feels that the situation is beyond his control. He thinks that 'iron laws of tradition' and 'law on four sides' got him into such a predicament. His masculinity and self-esteem are under threat as he requires exhibiting aggressiveness and strength, the characteristics of American hegemonic masculinity.

Initially he fights the enemy with great valour but when they strike for the second time he flees the battle field. It is an instinctive act, but as soon as he is out of the immediate danger he begins to rationalize his actions. He undergoes masculine gender role stress when he breaks the war code. His unconsciousness act of throwing a pine cone at a squirrel which flees for its life makes him feel that it is a sign from Nature asserting his moves. The animal side of Henry's nature to protect himself instead of being a man to face the crisis wins. The conflict between his instincts and set standards dominate the opening chapters of the novel.

Henry justifies his moves and joins the regiment. He encounters a fellow soldier Jim Conklin who sustains till the end in the battle. Though he is afraid he remains at his post. The author seems to portray that all men are basically afraid. Some he feels run like rabbits and squirrels and some stand like men. Instinct need not always predominate.

The death of Jim Conklin, the wound that he receives on his head from a soldier of his own regiment changes Henry remarkably. He fights with

a new vigour and becomes a hero. The struggle he undergoes both internally and externally makes him a man. The heart of *The Red Badge of Courage* is again the heart of Crane's concept of man".¹

Henry Fleming is an insignificant pawn in totality of war but his insignificance does not deprive him of his free will and moral responsibility. He possesses the capacity to fulfill his humanness by conquering his instinctive fears with a feeling of involvement with his fellow soldiers and achieves manhood. His identity is established and his homogenous masculinity over fellow soldiers is exercised.

Crane insists that to be a man means willed involvement in human struggle and further stresses that man should be engaged in the "Promethean Struggle" without the hope of either victory or reward. Crane's conviction about man, universe and forces that dictate the events in the life of man is clearly understood in this comment.

'The Central factor in Crane's concept of man is his conviction that man is an insignificant isolate in a universe that does not regard him as important. Alone in this neutral universe man can act freely but the success or failure of that action is dependent upon the operation of fate'.²

His philosophy is not only the result of determinism: but also modification of religious orientation through his perception of the realities of life. The past, the changing world with new scientific advancements and his own code of conduct have created a conflict and it is reflected in all his works. This conflict in his mind had made him the rebel of his day. He revolts not only against the social conditions of his time but also against the smug complacency of genteel tradition and the conventional standard of American literature. He wants 'art straight', a nearness to life and personal honesty. Like Keats, he voices belief that the work of art is born out of pain. Of *The Red Badge of Courage* he writes:

"It was an effort born out of pain- despair, almost; and I believe that this made it a better piece of literature than it otherwise would have been. It seems a pity that art should be a child of pain and yet I think

it is. Of course, we have fine writers who are prosperous and contented but in my opinion their work would be greater if this were not so. It lacks sting it would have if written under the spur of a great need".³

Out of his pain and conflict is born the protagonist of this novel who has no identity, being a mere soldier, dominated by his instinct and assailed by fear. He struggles against his initial fears, flees from the battlefield and ultimately emerges as a victor and is initiated into the battling community. The novel is the psychological evolution and transition of a foot soldier from adolescence to manhood.

Henry Fleming is the central character and through his eyes the readers see the roar of booming guns, the pictures of men dominated by instincts, the sinuous movement of army and the din of the battle scenes of American Civil War. The protagonist feels that he is pawn governed by forces that are beyond his control. His fellow soldiers feel that the army is the instrument of fate which trapped them. The ordeal of an illusion filled youth who dreams of being a hero but faced the actual terror of battle and the aimless wanderings of the soldiers without any rule or pattern dominated by confusion, terror and anxiety and even nature's external peace and internal disquietude are projected in the very opening lines as follows:

"The cold passed reluctantly from the earth and the retiring fogs revealed an army stretched out on hills, resting. As the landscape changed from brown to green, the army awakened and began to tremble with eagerness at the noise of rumour. It casts its eyes upon the road, which were growing from the long troughs of liquid mud to proper thorough fares. A river amber tinted in the shadow of its banks, purred at the army's fee; and at night, when the stream had become of a sorrowful blackness, one could see across at the re, eye like gleam of hostile camp fires set in the low brows of distant hills"⁴

He will have to

"... go into blaze, and then figuratively to watch his legs to discover their merits and faults" (TRC. p.10).

Until now he has never known the real danger. Crane's youth wants to shine in the war and to measure himself against the courage of others. He aims at hegemonic masculinity in the battle field and gain control over his peers. The conflict between the desire for heroism and the possibility of cowardice takes on such proportions that he finds himself in a terrible irresolution. Like a swinging pendulum he veers from one extreme to another blaming the unbearable slowness of it all for his unhappiness. Time passes and the regiment is finally called upon to march. No action, however, is encountered. During rest period he ponders over his enlistment and wallows in self-pity.

"He lay down in the grass. The blades pressed tenderly against his cheek. The moon had been lighted and was hung in a tree top. The liquid stillness of the night enveloping made him feel vast pity for himself. There was a caress in the soft winds and the whole mood of the darkness, he thought was one of sympathy for himself in his distress". (TRC, p.14).

As the youth walks along with his regiment, he encounters a dead soldier and is traumatized at the sight. He shudders as he looks at the mass of inert flesh. He feels lonely and isolated. Solitude and dissociation make sharp inroads deep into the youth's psyche. The enemy is surely ready to strike him. Fear imposes itself once again and with it is a sense of entrapment. The inevitability and compelling movement of the battle are perceived by Henry.

"But he instantly saw that it would be impossible for him to escape from the regiment. It enclosed him. And there were iron laws of tradition and law on four side; he was in a moving box". (TRC, p.19).

As the battle proceeds Crane describes the youth's regiment under constant gunfire loaded with rifles, blood soaked faces, the soldiers fight in the smoke infested area. Henry also participates and fires a wild shot. He no longer feels menaced or alienated. On the contrary he feels a bond to them. His concern is to win the war. An inner flame has ushered in mysterious feelings of fraternity as 'subtle battle brotherhood' is born of smoke and

danger. As the din slackens, the youth's frenzy diminishes and his reason returns, convinced of final victory he smiles in deep gratification and this ecstasy is short lived. The piercing cry of the attacking enemy grips him and panic-stricken, he runs like a rabbit. He leaps across the open fields and volleys of exploding shells and only when he stops running does he learn regiment has held. He cringes in shame, masculine gender role stress occurs and he regrets his unmanly act. Even these feelings of guilt are short lived. He instantaneously tries to rationalize his fright.

He runs deep into the forest and nature appears to the youth in the guise of "a woman with deep aversion towards tragedy" inspiring him with religion of peace. Nature takes the personality of his mother trying to help him out of the quandary. Although he cannot face his act of cowardice, he feels comforted by what he sees as nature's approval of his fright. He justifies his protective instinct. He feels that even a rodent recognizes that one must escape from danger. With these thoughts of self-justification he feels freer and convinced. His encounter with a corpse and his yearning to find peace in the chapel like woods fill him with new faith. He once again joins his fellow soldiers and in the chaos that follows, one of the soldiers of his regiment hurts him with his rifle. With the gaping wound on his head, he feels the sense of identity. On his way to his regiment, Henry meets the blood soaked tattered soldier. Each time the tattered man asked questions about the wounds, the youth feels as if a knife had been thrust into him but it does have a clinical effect on him.

He finally reaches his regiment. He is helped by his fellow soldiers who are unaware of his ignoble flight. In spite of the guilt he feels accepted and realizes that he is neither better nor worse than other men in the regiment. They all are made of same fabric, possessing both courage and cowardice.

After these incidents Henry passes initiation. He experiences a kind of revelation. Nature instills in him sense of life and vigour. When the youth hears the sound of hollow drums and raw tones of bugle, he knows that he is entering new world.

During the course of battle that follows later, he fights with fury and rage. His comrades in arms look at him admiringly; they have now become the spectators he once was. He is driven into frenzy of action and 'like a madman' pushes forward and wrenches the flag out of the clenched fist of the dead standard bearer. Together with loud soldier, he carries it through the thick and thin of the battle. The flag flying in his hands, he stands in the battle field towering over his peers as an epitome of hegemonic masculinity.

As the fighting subsides, the youth thinks of his failures and achievements. He realizes that he is a complex of opposites. He knows he is a man now. A man of identity and a man initiated into the society. When youth's days of battle for identity come to a close, he feels regenerated and longs for peace.

An American Tragedy published in 1925 is another triumph of Dreiser in the genre of Naturalism. It is set on a murder trial inspired by the prevalence of crime in materialistic American society. About 1894 Dreiser became interested in a type of crime which the American Dream seemed to generate. A young man, struggling to rise out of poverty, murders a working girl whose prior claim on him, blocks his marriage to a rich girl. His earlier title *Mirage* is replaced by *An American Tragedy* which dramatically exemplifies pervasive social reality. Dreiser explores facts in the fifteen typical murder cases and Chester Gillette – Grace Brown case forms the basis for this novel. Dreiser too as a youth has felt oppressed by his poverty-stricken background as he daydreams of better life, sexual fulfillment and hope of marrying well. *An American Tragedy* is pre-eminently a recreation of American experience into which Dreiser pours the anguish and frustration of his own life.

An American Tragedy has three sections; the first describing Clyde's childhood, early youth in Kansas City; the second recounting his later struggle in search of identity and initiation into moneyed circles which ends up in murder; and the third telling of his trial and execution.

The book opens in the commercial heart of an American City where a drab family of street preacher is preaching to a crowd of onlookers. Their

son Clyde Griffiths is very restive and wants his parents to be like other people. He wants his share of material comforts and an identity in the society. Even though, he thinks constantly about how he may better himself, Clyde has much of his father's impractical make up. Clyde's dilemma is even more acutely felt by his older sister, Esta, who is seduced and abandoned when she becomes pregnant. Like Clyde, Esta is lured by the material world. She becomes the victim of gender biased society.

Clyde's first step toward realizing his ambitions is to take a job in a drug store patronized by actors and theatergoers. The first encounter with the material world creates an identity crisis. He wants more than he has. He wants to be a part of this dream world. He takes a job as a bell hop boy at Green- Davidson, the principal hotel in Kansas City. To spend money on clothes, he deceives his mother about his earnings. With his new found identity, he pursues Hortense Briggs. Hortense's willingness to sell her sexual favours in exchange of a fur jacket reinforces his conviction in the power which clothes have to open the way of good fortune. Clyde and Hortense and several of their friends go on an auto trip in a borrowed vehicle. An accident occurs; the car strikes and kills a young girl. The instinct which Clyde shows is to run away. Though he is not the driver, he is gripped by fear and tries to flee. His masculine role gender undergoes stress and fear operates and he refuses to shoulder his responsibilities manfully. He leaves Kansas City in an attempt to flee the police. His flight is well described in the following words.

"Clyde....began crawling upon his hands and knees at first in the snow South, South and West always\ toward some of those distant streets which, lamp lit and faintly glowing, he saw to the South-West of him and among which presently, if he were not captured, he hoped to hide- to lose himself and so escape- if the facts were only kind- the misery and the punishment and the unending dissatisfaction and disappointment which now, most definitely it all represented to him".⁵

Book-II begins with Clyde in Chicago under a concealed identity, following the death of the child

in Kansas City. He limits his options by adopting his fugitive existence. Everything he says and does must protect his secret. But his chance encounter with his uncle Samuel Griffiths opens a new door to him. Clyde perceives a sharp contrast between his uncle's lavish home and shoddy surrounding in his home town, Kansas City. He feels that his struggle to find an identity is going to end. This encounter presents him with a promise and possibility to be initiated into his dream world. His uncle, Samuel Griffiths a well known businessman in New York City, a picture of hegemonic masculinity becomes his role model. Clyde joins his uncle's collar factory. His quest for identity begins. He is over awed in the presence of his superiors at the factory, but when confronting those under his authority, he tries to exercise his hegemonic masculinity. He holds his head higher and speaks with assurance.

He recognizes the appalling gap between economic groups in America. He watches a parade in Lyncurgus, New York, replete with floats on which are perched the rich, beautiful and happy society girls he dreams of. He is a spectator and a lonely one hovering between the two worlds- his impoverished world of struggle and his uncle's world of pomp. High society is a revelation of Clyde. It is limited world where the state of one's purse dictates the social connections. Into this society, he craves and struggles to be initiated. Clyde learns that to attain identity in this world one has to get into something and be somebody. Clyde writes to his mother: "I want to do something in this world I want to be successful...I got to get on in this world" (AAT, p.162).

Clyde resolves to work steadily, make right connections and conduct himself well so that remarkable men might take fancy to him and offer him with a connection something important, somewhere. They might lift him up into a world such as he had never known his plan is one which animated every rags-to-riches novel. His uncle a natural survivor and a symbol of success, in spite of his deceptive nature of exploiting his employees including Clyde, his nephew, is emulated. Social Darwinism of survivor ousting the weakling is seen. Those born with natural ability will manage to rise from the bottom while the lazy and the unintelligent

will be weeded out. The irony of it as Dreiser portrays is that not everyone who struggles can survive. According to Dreiser it is a paradox. The rich justify their success as the result of their untiring labour and present themselves as worthy. Their hegemonic masculinity daunts the poor who feel inferior to the rich and treat them as superior in strength and intelligence. They feel the world around them as over powering and intimidating and their natural initiatives are thwarted by fear and cowardice. Clyde is lured into this web of material success, vaguely aware of its destructive consequences. He wants more money and higher social status. He appears more polished and assured than what he was at Kansas City.

Clyde's dream paradise includes the flesh of sex as well as the spirit of wealth and position. He initially flirts with Rita an acquaintance of his friend Dillard. Then Roberta enters his life. From the moment Clyde and Roberta begin their courtship Clyde views Roberta as a factory girl, as someone he might win and love and be happy with but is someone he would never marry, whereas Roberta views Clyde as one who can initiate her into the world of materialism giving her social security she so desires. In this relationship Clyde's hegemonic masculinity is at its heights and Roberta gets trapped and becomes the victim. Roberta succumbs to Clyde and she instinctively falls into the role which her patriarchal background had prepared for her, that of a submissive and dutiful woman who looks to her Lord for support and direction.

Clyde, in spite of his attraction towards Roberta, plans to marry Sondra Finchley because she "materialized and magnified for him the meaning of the upper class itself". When Clyde learns that Roberta is pregnant he is filled with fear and anger. He resents her claim upon him. It is ironic that Clyde and Roberta are now mirror images of each other's social hopes and fears. Each of them struggles to extricate themselves from the situation. She struggles to hold on to Clyde and he struggles to escape.

Now Clyde wants to run away for the second time. It is Sondra, a dream of his life, which prevents him from running away. Clyde's dilemma, his anxiety and fear become a psychological frenzy.

He is filled with inner turmoil close to mental derangement. "A nervous and almost deranged look-never so definite or powerful at any time before in his life – the borderline look between nervous and unreason" (AAT, p.35).

Weeks preceding Roberta's death Clyde undergoes a violent struggle between fear and hesitation. He has overwhelming desire to solve his problem at all costs. He hallucinates the voice of a genie which is only Clyde's own suppressed unconsciousness. He allows his second personality to take command. He makes a trip to North woods merely to plead with her to release him. A strain of ambiguity to the problem of Clyde's guilt is seen as he is impelled by a kind of insanity. It raises Clyde from his usual mediocrity of hesitation and fear to the momentary height of a man. His hegemonic masculinity is active and is controlled by dark impulses.

He rents a boat at Lake Big Bittern and helps Roberta get in. the lure of entry into a world of the rich and the famed blinds him and he divorces himself from reality. His imaginary 'Giant Efril' advises him to ignore Roberta's cry for help and to let her drown. Alone with Roberta in secluded reach of the lake Clyde faces a dilemma to act or not to act. Roberta notices his contorted appearance. She screams for help, listening to his hallucinatory voices he gives an accidental blow with the camera. As she reels, he tries to offer her help suddenly feeling pity for fear.

In this ensuing confusion, the boat capsizes and Roberta falls into the water. She screams for help but the genie reappears and whispers exonerating words. Roberta sinks. Clyde swims to the shore, hides the camera tripod and heads towards South through woods. Though he encounters woodmen, his escape is uneventful until he joins Sondra's family friends, the Crane Stones. In spite of the guilt of the murder he falls back into the round of tennis, picnic, canoeing and even love making.

In the opening of Book-III camera tripod is found and traced to Clyde. Even Roberta's possessions link her to Clyde. A warrant is obtained to enter his room in Lycurgus and there the pleading letter Roberta had written concerning her

pregnancy is discovered. A warrant is issued for Clyde's arrest. He is arrested at Sondra's friends' house and taken to Cataraugus Country Jail to await his trial. He is no longer a poor boy; he is identified as a rich society boy who has slain a poor working girl. So the newspapers categorize him. His initiation into the desired society ends up in self-destruction. Now he is a murderer awaiting trial and punishment. Clyde is bewildered. He thinks of the man who seduced his sister and who is free. His crime is the desire to move up the social ladder and he is now thrown into the hopeless pit. His obsession with social identity leaves him afraid of his past and unsure of his future. Ironically just at the moment where he thinks he is initiated into the community, free of all shackles, he is arrested. At this point of initiation his self-destruction begins.

The concluding book deals with Clyde's capture, trial and execution. Through the speeches of his defense lawyer and the proceedings of the trial Dreiser tries to show how Clyde is not only a murderer but himself a victim and the mockery of the elaborate machinery of justice which has different standards for the rich and the poor. Even the District Attorney Orville W. Mason seizes upon Clyde's plight as a means to further his own ambitions. As Clyde sought to destroy Roberta to realize his material ambitions, Mason now seeks to destroy Clyde to gain the same goal. Not a single member of the Jury can help. Clyde is convicted and sentenced to death by electric chair.

Dreiser's concern is not with crime or an advocacy on behalf of the criminal but with a society which is really responsible for such tragedies. The last thoughts of Clyde reinforce the same conviction of Dreiser. "He really was not guilty- was he, since at the last moment he had experienced change of heart?" (AAT, p.800).

His conviction and his final moments are overshadowed by ambiguity. The young preacher, McMillan, prepares him for repentance and salvation. He tells his mother that God has heard his prayers but he is asking himself "Had He?" Clyde goes to death not knowing what he really knows or feels or what he has done. The theme of ambiguity runs throughout. Clyde lives in ambiguous dreams

and most important thing shrouded from his sight is his own identity.

Crane and Dreiser set their male protagonists in a society where struggle is inevitable. Whether for identity or initiation, Henry Fleming struggles to survive in the battlefield and towards the end conquers his fear. He is identified as a warring hero and is initiated into the battling community. Clyde Griffiths also struggles to survive in the materialistic society. His identity and initiation are short lived for he makes an irrevocable error which destroys him completely. The world may see him as an ambitious man set on a journey of self-destruction but as Dreiser points out that he is the victim of the forces beyond his control. Henry Fleming and Clyde Griffiths are small town boys, naïve, aspiring to be somebody. Though the setting is different, their quest for identity and their ambition to be initiated into the communities of their desire make them literary brothers.

If fear is the stumbling block to Henry, it is poverty and mirage like wealthy society to Clyde. Both Henry and Clyde in the hour of adversity flee. Their masculinity is under stress. They experience shame and guilt. Henry's cowardly fleeing from the battlefield to protect himself can be compared to Clyde's flight to Kansas City when his car kills a young girl accidentally.

Henry's retreat into forest causes a cleansing effect. He justifies his protective instinct taking a clue from a jovial squirrel. He rejoins the regiment with renewed vigour and fights the battle and establishes his hegemonic masculinity over his peers. He wins the admiration of his fellow soldiers. His wounds caused by his own regimental private turns out to be the red badge of courage which initiates him into the battling brotherhood. It is no longer a symbol of shame but a symbol of triumph, whereas, Clyde's fleeing continues. First he flees from Kansas City from the scene of accident and New York City from the scene of murder. In the first flight he is controlled by fear and in the second by moneyed circles. Unlike Henry he experiences neither soothing voice of Nature nor a sign from Nature. He emerges out of the woods with guilt and hears only hallucinatory voice of an imaginary genie. At the end he recognizes the truth that he has fled

from responsibility and self. His tragedy is that of namelessness and it is the story of individual without identity. Henry's flight to Nature results in discovery of his identity and Clyde's flight and return from the woods begin his loss of identity and destruction.

The flight into the forest kindles surviving instinct in Henry, whereas, the same forest where murder is committed causes Clyde's downfall and he gets snuffed out in the race of life as a moral transgressor.

Clyde is not a villain and Henry is not a giant hero. The choices made by them, influenced by the society and standards set by hegemonic masculinity decide them to be winners or losers. Crane and Dreiser attack the social institutions. Crane moves further in support of 'Promethean Struggle', struggle without hope of success. He believes in human dignity which arises from the attempt whether the outcome is success or failure. He sums upon his own words his conviction about struggle to be normally courageous and honest.

"I merely say that as nearly honest as weak mental machinery will allow. This aim in life struck me as being the only thing worthwhile. A man is sure to fail at it, but there is something in the failure".⁶

End Notes:

1. Robert W. Schneider – Five Novelists of the Progressive Era (Columbia University Press, New York & London 1965), p.9.
2. Robert W. Schneider – Five Novelists of the Progressive Era (Columbia University Press, New York & London 1965), p.110.
3. The Red Badge of Courage (Mod.Lib.ed. New York), pp. XVI-XVII.
4. Crane Stephen: The Red Badge of Courage and related reading by Greene and Bertrand (Prentice Hall, Inc., Englewood Cliffs, New Jersey, p.1966). Hereafter the references of this book are in parenthesis.
5. An American Tragedy; New York; Liver light Publishing Corporation, 1925, p.7.

Hereafter the references of this book are in the parenthesis.

6. Stallman, R.W. Ed: Stephen Crane: An Omnibus, New York, Alfred D. Knof, 1961, 52, p.680.

WORKS CITED

Primary references

1. Crane Stephen: The Red Badge of Courage and related reading by Greene and Bertrand (Prentice Hall, Inc., Englewood Cliffs, New Jersey, p.1966).
2. Crane Stephen: The Red Badge of Courage (Mod. Lib.ed. New York).
3. Dreiser Theodore: An American Tragedy; New York; Liver light Publishing Corporation, 1925.

Secondary References

1. Schneider Robert W. – Five Novelists of the Progressive Era (Columbia University Press, New York & London 1965)
2. Stallman R.W. Ed: Stephen Crane: An Omnibus, New York, Alfred D. Knof, 1961.

Use Of Soil And Water Assessment Tool For Sediment Modeling

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The soil is the natural, dynamic, heterogeneous, non-renewable resource, which supports plant and animal life. It is the most precious primary resource for the very existence of humankind. Soil and water problems in Varanasi are stressed due to rising population and climate change. The studies showed that the changing climate and intense human activities would complicate the situation endangering the water and soil resources. To support sustainable uses of these resources, an appropriate model is required in this area and to develop such model runoff, evapotranspiration and soil erosion modeling is essential. In this paper, soil and water assessment tool (SWAT) is used to model sediment yield processes of Varanasi watershed in the Ganga basin. Ten years of daily meteorological data, soil data procured from the National Bureau of Soil Survey, digital elevation model of 90 m resolution and Landsat 8 satellite imagery are used as inputs. The watershed was divided into 39 sub-basin for analysis and modeling. The Sufi-2, Parasol and GLUE algorithms were used for validation and calibration. The data was divided into two halves of 5 years each. First half was used for calibration and the second half for validation of the model. The results revealed that more than half of the annual precipitation water is lost in evapotranspiration and runoff. Sediment yield of various soil erosion-prone areas was estimated. The results from modeling would be further used to propose and model multiple water conservation and sediment filtration basin structures in the flood and soil erosion impacted areas. This study also revealed that how the SWAT model is valid to be used in hydrological and soil erosion modeling. These results can be further implemented for improving water and soil quality of the watershed.

Keywords

Runoff, Soil erosion, SWAT, Watershed, Evapotranspiration

References

1. Young, R.A., et al. 1989. AGNPS: A nonpoint-source pollution model for evaluating agricultural watersheds. J. soil and water conservation. 44(2):168-173.
2. Refsgaard, C.J. 1995. Mike she. Computer models of catchment hydrology. pp 809-846.
3. Arnold, J.G., et al. 1998. Large area hydrologic modeling and assessment part I: model development. JAWRA J. Am. Water Resour. Assoc., 34(1):73-89.
4. Tripathi, M.P., R.K. Panda and N.S. Raghu-wanshi. 2003. Identification and priori-tisation of critical sub-watersheds for soil conservation management using the SWAT model. Biosystems Eng., 85(3):365-379.
5. Didone, E.J., J.P.G. Minella and O. Evrard. 2017. Measuring and modelling soil erosion and sediment yields in a large cultivated catchment under no-till of southern Brazil. Soil Tillage Res., 174:24-33.
6. Yesuf, H.M., et al. 2015. Modeling of sediment yield in Maybar gauged watershed using SWAT, northeast Ethiopia. Catena., 127: 191-205.
7. Li, P., et al. 2017. Comparison of soil erosion models used to study the Chinese loess plateau. Earth Sci. Rev., 170:17-30.
8. Pandey, A., et al. 2008. Runoff and sediment yield modeling from a small agricultural watershed in India using the WEPP model. J. Hydrol., 348:305-319.
9. Shivhare, N., et al. 2017. Hydrological planning of watershed of RGSC, Mirzapur, U.P., using GIS techniques. Dev. Water Resour. India. Water Sci. Tech. Libr., 75:3-18.

10. Chandramohan, T., B. Venkatesh and A.N. Balchand. 2015. Evaluation of three soil erosion models for small watersheds. *Aquat. Procedia*. 4:1227–1234.
11. Mahmoodabadi, M. and A. Cerda, 2013. WEPP calibration for improved predictions of interrill erosion in semi-arid to arid environments. *Geoderma*, 205:75–83.
12. Shivhare, N., et al. 2017. Identification of critical soil erosion prone areas and prioritization of micro-watersheds using geoinformatics techniques. *Ecol. Eng.*, 1-9.
13. Jeong, J., et al. 2013. Modeling sedimentation-filtration basins for urban watersheds using soil and water assessment tool. *J. Env. Eng.*:139, 838–848.
14. Mittelstet, A.R., D.E. Storm and M.J. White. 2016. Using SWAT to enhance watershed-based plans to meet numeric water quality standards. *Sustain. Water Qual. Ecol.*, 7: 5–21.
15. Kinnell, P.I.A. 2017. A comparison of the abilities of the USLE-M, RUSLE2 and WEPP to model event erosion from bare fallow areas. *Sci. Total Env.*, 596-597:32–42.
16. Fukunaga, D.C., et al. 2015. Application of the SWAT hydrologic model to a tropical watershed at Brazil. *Catena*, 125:206–213.
17. Arnold, J.G. and P.M. Allen. 1996. Estimating hydrologic budgets for three Illinois watersheds. *J. hydrology*. 176(1-4):57-77.
18. Prabhanjan, A., E.P. Rao and T.I. Eldho. 2014. Application of SWAT model and geospatial techniques for sediment-yield modeling in ungauged watersheds. *J. Hydrologic Eng.*, 20(6):C6014005.
19. Karcher, S.C., J.M. VanBriesen and C.T. Nietch. 2013. Alternative land-use method for spatially informed watershed management decision making using SWAT. *J. Env. Eng.*, 139(12) : 1413-1423.
20. Sardar, B., et al. 2012. Hydrological modeling to identify and manage critical erosion-prone areas for improving reservoir life: Case study of Barakar basin. *J. Hydrologic Eng.*, 19(1):196-204.
21. Qiu, Z. and L. Wang. 2013. Hydrological and water quality assessment in a suburban watershed with mixed land uses using the SWAT model. *J. Hydrologic Eng.*, 19(4):816-827.
22. Vilaysane, B., et al. 2015. Hydrological stream flow modelling for calibration and uncertainty analysis using SWAT model in the Xedone river basin, Lao PDR. *Procedia Env. Sci.*, 28:380-390.
23. Shi, P., et al. 2013. Application of a SWAT model for hydrological modeling in the Xixian watershed, China. *J. Hydrol. Eng.*, 18:1522–1529.
24. Williams, J.R. 1995. The EPIC model in computer models of watershed hydrology (chapter 25). *Water Resources Publications, Highlands Ranch*. pp 909-1000.
25. Arnold, J.G., et al. 2012. SWAT: model use, calibration, and validation. *Trans. ASABE*. 55:1491–1508.
26. Abbaspour, K.C. 2007. User manual for SWAT-CUP, SWAT calibration and uncertainty analysis programs. *Swiss Federal Institute of Aquatic Science and Technology, Dübendorf, Switzerland*.
27. Pisinaras, V., et al. 2010. Hydrological and water quality modeling in a medium-sized basin using the soil and water assessment tool (SWAT). *Desalination*. 250 (1):274-286.

A Study Of Effects Of Organic Compounds And Fe And Zn Nano-Fertilizers On The Yield And Absorption Of Macronutrients In Tomatoes

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To investigate the effect of Zn and Fe nanoparticles, as well as vermicompost and humic acid on the yield and absorption of macronutrients in tomato, a factorial experiment with a randomized complete block design was conducted at Agricultural and Natural Resources Research Center of Torogh. The first factor consisted of organic compounds at three levels of control (non-consumption), application of 5 tonne/ha of vermicompost and application of 5 kg/ha of humic acid. The second factor comprised of Fe nanoparticles at two levels of control (non-consumption) and use of 2.6 kg/ha of nano Fe-oxide and the third factor consisted of Zn nanoparticles at two levels of control (non-consumption) and use of 2.6 kg/ha of nano Zn-oxide. The samples of each plot were obtained from three central lines by removing 1 m from each side. A leaf sample and a fruit sample were derived from each plot and analyzed to determine the concentration of macronutrients. The results showed that the highest nitrogen concentration of fruit was observed in control treatments and combined use of humic acid and Zn nanoparticles. The highest phosphorous and potassium concentrations in leaves and fruit yield were observed at different levels of organic compound treatments (including humic acid and vermicompost) and the application of Zn and Fe nanoparticles. The lowest level was also observed in non-consumption of organic compounds and Zn and Fe nanoparticles. In the interaction of organic compounds and Zn nanoparticles, the combined use of humic acid and Zn nanoparticles showed the highest and the combined use of vermicompost and Zn nanoparticles revealed the lowest phosphorous concentration in the fruits. The comparison of the mean interactions of organic compounds and Fe nanoparticles, as well as Zn and Fe nanoparticles, suggested that except for the treatment of Fe nanoparticles (alone), which was placed at a lower class, other treatments were placed at the same statistical group in terms of phosphorous concentration in the fruit. In general, the use of humic acid and vermicompost as sources of organic compounds could contribute to the absorption of macronutrients by plants, increasing phosphorous and potassium concentrations in leaves as well as nitrogen and phosphorous concentrations in tomato, which enhanced the overall yield of tomatoes.

Keywords

Humic acid, Macronutrients, Vermicompost, Nanoparticles

References

1. Picard, D., et al. 2010. Does under sowing winter wheat with a cover crop increase competition for resources and is it compatible with high yields ? Field Crops Res., 115:9-18.
2. Fitzgerald, G., D. Rodriguez and G.O. Leary. 2010. Measuring and predicting canopy nitrogen nutrition in wheat using a spectral index. The canopy chlorophyll content index (CCCI). Field Crops Res., 116:318-324.
3. Khoshpeyk, S., R. Sadrabadi Haghghi and A. Ahmadian. 2017. The effect of application of nitrogen fertilizer and nano-organic manure on yield, yields components and essential oil of fennel (*Foeniculum vulgare* Mill). Iranian J. Field Crops Res., 14(4):775-787.

4. Naderi, M.R. and A. Danesh-Shahraki. 2013. Nanofertilizers and their role in sustainable agriculture. *Int. J. Agric. Crop. Sci.*, 5:2229-2232.
5. Nair, R., et al. 2010. Nanoparticulate material delivery to plant. *Plant Sci.*, 179:154-163.
6. Green, J.M. and G.B. Beestman. 2007. Recently patented and commercialized formulation and adjuvant technology. *Crop Prot.*, 26:320-327.
7. Torney, F., et al. 2007. Mesoporous silica nanoparticles deliver DNA and chemicals into plants. *Nat. Nanotech.*, 2:295-300.
8. Hiyasmin Rose, L., et al. 2015. Nano fertilizer effects on the growth, development and chemical properties of rice. *Int. J. Agronomy and Agricultural Res.*, 7(1):105-117.
9. Waqas, M., et al. 2014. Evaluation of humic acid application methods for yields and yield components of mungbean. *Am. J. Plant Sci.*, 5:2269-2276.
10. Samavat, S., A. Lakzian and A. Zamirpour. 2001. Effect of vermicompost on some growth indices of tomato. *Agriculture Sci. and Industries J.*, 15(2):83-89.
11. Chen, Y. and P. Barak. 1982. Iron nutrition of plants in calcareous soils. *Advances in Agronomy*. 35:217-240.
12. Ghafariyan, M.H., et al. 2013. Effects of magnetite nanoparticles on soybean chlorophyll. *Env. Sci. and Tech.*, 47:10645-10652.
13. Singh, N.B., et al. 2013. Zinc oxide nano-particles as fertilizer for the germination, growth and metabolism of vegetable crops. *J. Nano Eng. and Nano Manufacturing*. 3:353-364.
14. Report of Crops Statistics. 2016. Information and Communication Technology Center, Department of Programming and Economic, Agriculture Ministry of Iran.
15. Bremner, J.M. and C.S. Mulvaney. 1982. Nitrogen-Total. In *Methods of soil analysis (part 2)*. Ed A.L. Page. American Society of Agronomy, Madison, WI.
16. Chapman, H.D. and P.F. Pratt. 1961. *Methods of analysis for soils, plants and waters*. Division of Agricultural Sciences, University of California.
17. Waling, I., et al. 1989. *Soil and plant analysis. A series of syllabi part 7. Plant analysis procedures*. Wageningen Agriculture University.
18. Malakuti, M.J., et al. 2005. The causes of nitrate accumulation in vegetables (cucumber and tomato) and ways to control it. *Tech. J. Water and Soil Res. Inst.*, 414:1-23.
19. Rezvani Moghadam, P. and M. Seyyedi. 2009. The role of organic and biological fertilizers in uptake phosphorus and potassium by *Nigella* (*Nigella sativa* L.). *J. Horticultural Sci.*, 28(1):43-53.
20. Schoenau, J.J. 2006. Benefits of long-term application of manure. *J. Advances in Pork Production*. 17:153-158.
21. Ouda, B.A. and A.Y. Mahadeen. 2008. Effect of fertilizers on growth, yield, yield components, quality and certain nutrient content in broccoli (*Brassica oleracea*). *Int. J. Agriculture and Biology*. 10:627-632.
22. Astaraei, A.R. and A. Fattahi Kiasari. 2006. Effect of latex urban waste compost on some chemical properties of soil and pepper. *J. Agriculture*. 8(1):1-12.
23. Taiz, L. and E. Zeiger. 2006. *Plant physiology*. Sinauer Associates, Inc.
24. Alloway, B.J. 2004. *Zinc in soils and crop nutrition*. International Zinc Association Publications, Brussels, Belgium.
25. Romheld, V. and H. Marschner. 1991. Function of micronutrients in plants. In *Micronutrients in agriculture (book series no. 4)*. Ed J.J. Cox, F.R. Shuman and L.M. Welch. Soil Science Society of America, Madison, U.S.A. pp 297-328.

Assessment Of Air Pollutants At Selected Monitoring Stations Of Moradabad

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Moradabad is one of the brassware city of India and known as the 'Pital Nagari', it is famous for the brassware items which has elevated the risk of atmospheric pollution. The present study was carried out to assess air pollutants at selected monitoring stations using a statistical approach consisting of analysis of variance and air quality index (AQI). It is evaluated by monitoring PM₁₀, SO₂ and NO₂ at three different sites, that is Buddh Bazar (site I), Police Training Centre (site II) and Moradabad Development Authority (site III). Results are based on AQI calculator launched by MoEF, New Delhi. The AQI obtained from different sites is 194, 148 and 130 at sites I, II and III for the summer season and 226, 167 and 150 at sites I, II and III for the winter season, respectively. During monsoon, AQI observed is 183, 139 and 100 at sites I, II and III. The maximum AQI value was recorded at the site I in winter season while minimum at the site III in monsoon season. The exalted concentration of all the pollutants at the site I may be due to anthropogenic activities, that is vehicular density and generators near bus stand and railway station and a number of open brass melting furnaces pose a serious threat to air quality. Police training centre falls in high pollution category where roads, lanes and bylanes are swept every morning by a number of worker and trainees. Control site (Moradabad development authority) showed moderate pollution as it is relatively a clean area. The study concluded that a high number of vehicles and the brassware industries are responsible for the enhanced concentration of air pollution.

Keywords

PM₁₀, SO₂, NO₂, Air quality index, Health effect

References

1. Ghorani-Azam, A., B. Riahi-Zanjani and M. Balali-Mood. 2016. Effects of air pollution on human health and practical measures for prevention in Iran. J. Res. Med. Sci., 21:65.
2. Kumar, A., et al. 2017. Three year studies on particulate matter (PM₁₀ and PM_{2.5}) trends in industrial area Gajraula (U.P.). Int. J. Res. In Appl. and Natural Sci., 3(12).
3. Giles, H.V. and M.S. Koehle. 2014. The health effects of exercising in air pollution. Sports Med., 44:223-249.
4. Gangwar, C., et al. 2017. Environmental susceptibility : Soil contamination of heavy metals in the territory of e-waste recycling area.
5. Seneviratne, M.C.S., et al. 2011. Characterization and source apportionment of particulate pollution in Colombo, Sri Lanka. Atmos. Poll. Res., 2:207-212.
6. Singh, B. Ram, et al. 2015. The ambient air pollution and the heart. World Heart J., 7:1556-4002.
7. Dong, G.H., et al. 2012. Long-term exposure to ambient air pollution and respiratory disease mortality in Shenyang, China : A 12-year population based retrospective cohort study. Respiration. 84:360-368.
8. Kesavachandran, C., et al. 2013. Particulate matter concentration in ambient air and its effects on lung functions among residents in the National Capital Region, India. Env. Monit. Assess., 185:1265-1277.
9. CPCB. 2015. National air quality index. Central Pollution Control Board, New Delhi. http://www.cpcb.nic.in/National_Ambient_Air_Quality_Index.php.
10. Gulia, S.M.S., et al. 2015. Urban air quality management—A review. Atmos. Poll. Res., 6:286-304.

11. Mahima, et al. 2013. Five year studies on suspended particulate matter heavy metal trends in brass city of India. *J. Env. Sci. Eng.*, 55:267-274.
12. Ediyagbonya, T.F., et al. 2014. Elemental concentration of inhalable and respirable particulate matter in urban area during winter season. *J. Appl. Sci. Env. Manage.*, 18:79-83.
13. West, P.W. and G.C. Gaeke. 1956. Fixation of sulphur dioxide as sulphitomercurate (II) and subsequent colourimetric determination. *J. Anal. Chem.*, 28:1816-1819.
14. Jacob, M.B. and J.B. Hochheiser. 1958. Continuous sampling and ultra micro determination of nitrogen dioxide in air. *J. Anal. Chem.*, 30:426-248.
15. Pal, R., et al. 2014. Assessment of heavy metal in suspended particulate matter in Gajraula. *Indian J. Env. Biol.*, 35:357-361.
16. Arora, S., et al. 2015. Air quality index and its possible impact on human health in industrial area of Garaula, U.P. *J. Ecophysiol. Occup. Health.* 15 (1 and 2) : 31-37.
17. Habil, M., D.D. Massey and A. Taneja. 2013. Exposure from particle and ionic contamination to children in schools of India. *Atmos. Poll. Res.*, 6(4):719-725.
18. Bieg, G., et al. 2010. Scientific evolution of air quality standards and defining air quality index for India 2010. Special scientific report SAFAR-2010-B. Ministry of Earth Sciences, Govt. of India.
19. Guttikunda, S. and B. Gurjar. 2012. Role of meteorology in seasonality of air pollution in megacity Delhi. *Env. Monit. Assess.*, 184:3199-3211.
20. Tripathi, A., Mahima and R. Pal. 2010a. Air quality index of different sites in Moradabad city. *Poll. Res.*, 29(3):471-476.
21. Jain, R and K. Palwa. 2015. Air pollution and health. Discussion paper by the Energy and Resources Institute, New Delhi. *Int. J. Plant and Env.*, 3(1):25-31.

Performance Study Of Fixed Bed Hybrid Bioreactor Treating Synthetic Carbonaceous Wastewater

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A laboratory scale fixed bed hybrid bioreactor of volume 15 L was fabricated with perspex sheet as an attached surface. The biofilm was developed on a frame made by combining nine angular fins with equal angular spacing. Synthetic carbonaceous wastewater was continuously fed with HRT ranging between 4-8 hrs, COD between 150-250 mg/L and biomass concentration in the range of 2000-3500 mg/L. The effluent COD, as well as the biomass concentration, was monitored for each continuous run until quasi-steady state condition reached. In order to judge the performance of the hybrid bioreactor, two important operating parameters, namely volumetric organic loading rate and F/M ratio have been taken into consideration. Fixed media support plays an important role to accommodate more and more attached biomass which enhances the removal of BOD/COD from wastewater. The effluent sample and reactor content were taken for measuring final COD concentration and steady state suspended biomass concentration, respectively.

Keywords

Fixed bed hybrid bioreactor, Biofilm, Volumetric organic loading, F/M ratio, Synthetic carbonaceous wastewater

References

1. Campbell, H. and A. Schnell. 2003. Upgrading activated sludge systems using free floating plastic media (online). Available from www.hydroxyl.com/papers/waterdown/Upgrade AS.pdf.
2. Lewandowski, Z. 1985. Nitrification process in activated sludge with suspended marble particles. *Water Res.*, 19 : 535-539.
3. Sen, D., and C.W. Randall. 1994. Performance of fixed film media integrated in the activated sludge reactors to enhance nitrogen removal. *Water Sci.Tech.*, 30:13–24.
4. Eckenfelder, W.W., Jr. 2000. *Industrial water pollution control* (3rd edn). McGraw Hill, Inc., Singapore.
5. Golla, P.S., et al. 1994. Three years of full scale captor process operation at Mound-ville WWTP. *Water Sci. Tech.*, 29 : 175-181.
6. Rostron, W.M., D.C. Stuckey and A.A. Young. 2001. Nitrification of high strength ammonia wastewaters : comparative study of immobilization media. *Water Res.*, 35: 1169-1178.doi:10.1016/ S0043-1354(00) 00365-1.
7. Chuang, S.H., et al. 1997. Effects of SRT and DO on nutrient removal in a combined AS-biofilm process. *Water Sci. Tech.*, 36 :19-27.
8. Gebara, Fadi. 1999. Activated sludge biofilm wastewater treatment system. *Water Res.*, 33 (1) : 230-238.
9. Fouad, M. and R. Bhargava. 2005. A simplified model for the steady-state biofilm-Activated sludge reactor. *J. Env. Manage.*, 74: 245-253.
10. Guang, H.C., H. Ju-Chang and M.C.Lo. 1997. Removal of rate limiting organic substances in a hybrid biological reactor. *Water Sci.Tech.*, 35 : 81-89.
11. Liu, J. X., et al. 1996. Removal of nitrogen and phosphorus using a new biofilm-activated-sludge system. *Water Sci. Tech.*, 34:315–322. doi:10.1016/0273-1223(96) 00521-5.
12. Su, J.L. and C.F. Ouyang. 1996. Nutrient removal using a combined process with activated sludge and fixed biofilm. *Water Sci. Tech.*, 34:477–486.doi:10.1016/0273-1223 (96)00537-9.

13. Rutt, K., J. Seda and C.H. Johnson. 2006. Two years case study of integrated fixed film activated sludge at Broomfield Co., WWTP. Proceedings of the Water Environment Federation. Session 10. pp 225-239.
14. Mazumder, D. 2010. Simultaneous COD and ammonium nitrogen removal from a high strength wastewater in a shaft-type aerobic hybrid bioreactor. Int. J. Env. Sci. and Develop., 1 (4) : 327-332.
15. Li, C., et al. 2011. Municipal wastewater treatment in a new type biocarrier reactor. Procedia Env. Sci., 10 : 962-967.
16. Lowry, O.H., et al. 1951. Protein measurement with folin phenol reagent. J. Biol. Chem., 193 : 265-275.

To Study use of Rubber Seed Oil Blends Diesel Fuel at Various Injection Pressures

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The physico-chemical properties of the fuel, such as viscosity, volatility, density, flash point and fire point affect the performance and combustion process. If high viscosity and density biofuel are directly supplied into the engine, complete combustion will not take place in the combustion chamber. Hence different methodologies are employed to get the better performance or atomization of the fuel. In this experimental study, the effect of injection pressure (IP) on the performance and emission of compression ignition (CI) engine fuelled with rubber seed oil as biodiesel and its blends with pure diesel was evaluated. The engine tests were conducted on constant speed diesel engine fuelled with diesel and various bio-blends of rubber seed oil (RSO) at the proportion of B20. The test results were compared with that of pure diesel as engine test fuel at various injection pressures of 200, 220 and 240 bar. The results show that the brake thermal efficiency has been improved with B20 (20% RSO and 80% pure diesel) at an IP of 240 bar compared to other biofuels at different injection pressures. It was also observed that the emissions, such as carbon monoxide (CO), unburned hydrocarbons (UHC) were considerably reduced and NOx emissions increased when compared to other biofuels at different injection pressures.

Keywords

Diesel engine, Rubber seed oil, Performance, Emission, injection pressure

References

1. Sunil Kumar Reddy, S. and V. Pandur-angadu. 2013. The effect of injection pressure on the performance of alcohol fueled insulated diesel engine. Int. J. Current Eng. and Tec., 3(4):1252-1256.
2. Karnwal, K., et al. 2013. Multi-response optimization of diesel engine performance parameters using thumba biodiesel-diesel by applying the Taguchi method and grey relational analysis. Int. J. Automotive Tech., 12(4):599-610.
3. Naga Sarada, S. and M. Shailaja. 2010. Optimization of injection pressure for a compression ignition engine with cotton seed oil as an alternate fuel. Int. J. Eng. Sci. and Tech., 2 (6) : 142-149.
4. Jindal, S., Nandwan and N.S. Rathore. 2010. Experimental investigation of the effect of compression ratio and injection pressure in a direct injection diesel engine running on jatropha methyl ester. Appl. Thermal Eng., 130:442-448.
5. Cha, Junepyo, et al. 2013. Effects of equivalence ratio on the near-stoichiometric combustion and emission characteristics of compression ignition (I) engine. Processing Tech., Fuel. 106:215-221.
6. Karthik, N. and S. Mahalingam. 2014. Emission characteristics on single cylinder constant speed diesel engine using diesel blends with jatropha and rubber seed oil. Int. J. Appl. Eng. Res., 9(21):11373-11380.
7. Mahalingam, S., et al. 2013. Experimental study of performance and emission characteristics of a bio-dual fuel blends in diesel engine for variation of injection pressures. World Congress on Engineering. London, U.K. Proceedings, Vol I.
8. Mahalingam, S., B. R. Ramesh Babu and B. Balaji. 2014. Emission analysis of di-diesel engine at different injection pressures using jatropha and rubber seed oil blended with diesel. IOSRJ. Mech. and Civil Eng., 78-80.

9. Ozer Can, et al. 2004. Effects of ethanol addition on performance and emissions of a turbo charged indirect injection diesel engine running at different injection. *Energy Conversion and Manage.*, 45:2429-2440.
10. Sayin, Cenk, Metin Gumus and Mustafa Canakci. 2012. Effect of fuel injection pressure on the injection, combustion and performance characteristics of a DI diesel engine fueled with canola oil methyl esters-diesel fuel blends. *Biomass and Bioenergy*. 46:435-446.
11. Dharmadhikari, H.M., Puli Ravi Kumar and S. Srinivasa Rao, 2012. Performance and emission of C.I. engine using blend of biodiesel and diesel at different injection pressure. *Int. J. Appl. Res. in Mech. Eng.*, 2:1-6.

Effect Of Plant Growth Promoting Rhizobacteria Isolated From Gangetic Plains Of North Bihar On The Soil Properties Of Organically Cultivated Momordica charantia Lin

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With the environment already bearing the brunt of pollution through assimilation of innumerable toxins and inorganic waste, tilling practices should control the indiscriminate use of chemical fertilizers. Plant nutrients coupled with the optimal use of green fertilizers resides at the heart of sustainable agricultural practices. It also implies that the soil type(s) and its influencing micro-climatic conditions should also consider before implementing fertilizers. As microorganisms play a vital role in biogeochemical cycles impacting on soils, this study aims to assess the effects of plant growth promoting rhizobacteria (PGPR) as an environmentally efficient biofertilizer, to investigate its efficacy in maintaining the salinity and in enhancing the microbial turnover of the soil. The methodology involved pot experiments on Momordica charantia Lin. (Jaunpuri variety) of the Cucurbitaceae family having nutritional value and therapeutic benefits. Two strains of Aneurinibacillus migulanus bacteria, S1(V)23 and S2(V)12 isolated from Gangetic plains of North Bihar and used as PGPR. The results of soil nutrients were compared with defined standards of macro and micro-nutrients of ICAR at the Central Soil Testing Laboratory, Patna. The study revealed that soil inoculated with the broth medium of S1(V)23, S2(V)12 and combined S1(V)23 x S2(V)12 showed increment in the organic carbon (1.241%, 1.093% and 1.210%) as compare to the soil dosed with chemical fertilizers (0.539%) though the N, K was found higher in the soil dosed with chemical fertilizer (554 kg/ha and 579 kg/ha) but P content was low (52 kg/ha) as compared to soil inoculated with PGPR(s) S1(v)23, that is, 78 kg/ha. The micronutrients in the soil were observed more in PGPR inoculated soil as compared to the soil chemically dosed. The CSTL has recommended these identified PGPR biofertilizers, a better option as compared to chemical fertilizer for various crops and cropping sequences of the state.

Keywords

Biofertilizer, North Bihar Gangetic plains, Plant growth promoting rhizobacteria, Macronutrients, Micronutrients, Momordica charantia Linn.

REFERENCES

1. Vessey, J. 2003. Plant and Soil. 255 : 71. Doi:10.1023/A:1026037216893.
2. Canbolat, et al. 2006. Effect of plant growth-promoting bacteria and soil compaction on barley seedling growth, nutrient uptake, soil properties and rhizosphere microflora. Biol. Fert. Soils. 42 : 350–35.
3. Higa, T., et al. 1994. Effective microorganisms : A new dimension for nature farming. Second International Conference on Kyusei nature farming. U.S. Department of Agriculture, Washington, D.C, U.S.A. pp 20-22.
4. Kloepper, J.W., et al. 1978. Plant growth-promoting rhizobacteria on radishes.
5. Ahemad, et al. 2009. Mechanisms and applications of plant growth promoting rhizo-bacteria : Current perspective. j. King Saud University-Sci., 26 (1) : 1-20.
6. Jackson, N. L. 1973. Soil chemical analysis. Prentice Hall of India Ltd., New Delhi. pp 498.

7. Walkley, A. and C. A. Black. 1934. An examination of the degtjareff method for determining soil organic matter and a proposed modification of the chromic acid titration method. *Soil Sci.*, 37(1) : 29-38.
8. Subbiah, B., et al. 1956. A rapid procedure for the estimation of available N in soils. *Current Sci.*, 25: 259-260.
9. Olsen, S.R., et al. 1954. Estimation of available phosphorus in soils by extraction with 0.5 M NaHCO₃ (pH 8.5). United States Department of Agriculture Circular 939, Washington D.C., U.S.A. *Agric.*, 939:1-19.
10. Hanway, J., et al. 1952. Soil analysis methods as used in Iowa State College Soil Testing Laboratory. *Iowa Agric.* 57 : 1-31.
11. Gouda, Sushanto. 2018. Revitalization of plant growth promoting rhizobacteria for sustainable development in agriculture. [https:// doi.org/ 10.1016/microbes.2017.08.016](https://doi.org/10.1016/microbes.2017.08.016).
12. Mohammadi, K. 2012. Phosphorus solubilizing bacteria : Occurrence, mechanisms and their role in crop production. *Resour. and Env.*, 2(1) : 80-85.
13. George, Silva. 2018. Improved soil structure, a season-long supply of nutrients and an increased water-holding capacity are just some of the benefits of using organic fertilizers. Michigan State University Extension.
14. Rana, Anuj, et al. 2012. Enhancing micronutrient uptake and yield of wheat through bacterial PGPR consortia. *Soil Sci. and Plant Nutrition. J.*, 58 (5).
15. Prasad, Rajendra. 2005. Organic farming vis-a-vis modern agriculture. *Current Sci.*, 89(2): 252-254.
16. Min, Wang, et al. 2013. The critical role of potassium in plant stress response. *Int. J. Mol. Sci.*, 14(4) : 7370-7390.
17. Bhardwaj, D., et al. 2014. Biofertilizers function as key player in sustainable agriculture by improving soil fertility, plant tolerance and crop productivity. *Microb Cell Fact.*, 13 : 66.
18. Ogbodo, E.N., et al. 2012. Effect of tillage and crop residue on soil chemical properties and rice yields on an acid ultisol at Abakaliki, southeastern Nigeria. *Nigeria J. Soil Sci.*, 22(1):73-85.
19. Bandyopadhyay, et al. 2010. Effect of integrated use of farmyard manure and chemical fertilizers on soil physical properties and productivity of soybean. *Soil and Tillage Res.*, 110 (1) : 115-125.
20. Gyaneshwar, P., et al. 2002. Role of soil microorganisms in improving P nutrition of plants. *Plant soil.* 245 : 83–93.
21. Sangakkara, U.R. 1999. Root dynamics and nutrient uptake efficiencies of mung bean as affected by organic matter and effective microorganisms. Fifth international conference on Kyusei nature farming. Bangkok, Thailand. pp 182-193.
22. Sakal, R., et al. 1984. Assessment of some chemical extractants for available zinc in relation to response of rice to applied zinc in sub Himalayan hill and forest soils. *Plant and Soil.* 79: 417-428.
23. Nayyar, V.K., et al. 2001. Management of soil micronutrient deficiencies in the rice-wheat cropping system. In *Rice-wheat cropping systems of South Asia. Efficient Production Management Food Product Press, New York, U.S.A.*
24. Rego, T., et al. 2005. Macro-benefits from boron, zinc and sulphur application in Indian SAT: A step for grey to green revolution in agriculture. Global theme on agroecosystems report no. 16. Patancheru.
25. Marschner, H. 1995. Mineral nutrition of higher plants. Academic Press, London, U.K. pp 352.
26. Steyn, C.E., et al. 2005. Trace elements in developing countries using South Africa as a case study. *Communications in Soil Sci. and Plant Analysis.* 36 (1–3) : 155–168.
27. Singh, M.V., et al. 1986. Transformation and movement of zinc in an alkali soil and their influence on the yield and uptake of zinc by rice and wheat crops. *Plants and Soils.* 94:445-449.
28. Mitra, et al. 2008. ipipotash.org/udocs.
29. al-labs-plains.com/soil/2511974. google search.
30. Patel, K.P., et al. 2009. Scenario of micro - and secondary - nutrients deficiencies and their management in soils and crops of arid and semi- arid regions of Gujarat. The Proceedings of the International Plant Nutrition Colloquium XVI. Department of Plant Sciences, UC Davis.
31. Kumar, A., et al. 2015. Does a plant growth-promoting rhizobacteria enhance agricultural sustainability? *J. Pure and Appl. Microbiol.*, 9:715–724.

32. Adak, et al. 2016. Micronutrient enrichment mediated by plant-microbe interactions and rice cultivation practices. *J. Plant Nutrition*. 39.
33. Saharan B.S., et al. 2011. Plant growth promoting rhizobacteria : a critical review. *Life Sci. Med. Res.*, http://astonjournals.com/manuscripts/Vol2011/LSMR-21_Vol2011.pdf
34. Black, C.A. 1965. *Methods of soil analysis (part I)*. Am. Soc. Agron. Inc. Publi., Madison, Wisconsin, U.S.A.
35. Malligawadi, Lokanath, et al. 2004. Influence of plant growth promoting rhizobacteria on the yield components and yield of groundnut. *Karnataka J. Agric. Sci.*, 17(4) : 658-662.
36. Singh, C.S. and N.S. Suba Rao. 1979. Associative effect of azo spirillum brasilense with Rhizobium japonicum on nodulation of soybean (*Glycine max*). *Plant Soil*. 53(3): 387-392.

Studies On Removal Of Ammonium By Steel Slag From Aqueous System

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Steel slag is a waste material from the steel industry. The potential of steel slag as an adsorbent for the removal of ammonium from the aqueous system is studied for treating wastewater having ammonium as one of the pollutants. The influence of various factors, such as initial concentration, adsorbent dosage and temperature on the adsorption capacity has been studied. The adsorption capacity is found to be 0.143 mg/g. The maximum ammonium removal is found to be 74%. The percentage removal of ammonium is observed to increase with an increase in the initial concentration of ammonium. The adsorption of ammonium is found to be spontaneous and endothermic in nature. The Freundlich equation is found to interpret adsorption isothermal data. Pseudo second order equation helps to understand the reaction mechanism. Fourier transform infrared (FTIR) studies confirm the ammonium adsorbed on the surface of the steel slag.

Keywords

Ammonium, Steel slag, Adsorption, Kinetics, Isotherms, Thermodynamics

REFERENCES

1. Ahmed, S., U. Chandra, and R.K. Rathi. 2010. Wastewater treatment technologies commonly practiced in major steel industries of India. Annual international sustainable development research conference 2010. The University of Hong Kong, Hong Kong.
2. Ahmed, Sirajuddin, Yogesh Nathuji Dhoble and Siddharta Gautam. 2012. Trends in patenting of technologies related to wastewater treatment. SSRN Electronic J., <https://doi.org/10.2139/ssrn.2148918>.
3. Randall, D.J. and T.K.N. Tsui. 2002. Ammonia toxicity in fish. *Marine Pollution Bulletin*. 45(1):17-23. [https://doi.org/10.1016/S0025-326x\(02\)00027-8](https://doi.org/10.1016/S0025-326x(02)00027-8).
4. Ruiz, G., et al. 2006. Nitrification-denitrification via nitrite accumulation or nitrogen removal from wastewaters. *Bioresour. Tech.*, 97(2):330-335. <https://doi.org/10.1016/0.biotech.2005.02.018>.
5. Ciudad, G., et al. 2005. Partial nitrification of high ammonia concentration wastewaters as a part of a shortcut biological nitrogen removal process. *Process Biochemistry*. 40(5):1715-1719.
6. Jorgensen, T.C. and L.R. Weatherley. 2003. Ammonia removal from wastewater by ion exchange in the presence of organic contaminants. *Water Res.*, 37(8):1723-1728. [https://doi.org/10.1016/50043-1354\(02\)00571-7](https://doi.org/10.1016/50043-1354(02)00571-7)
7. Park, Jongmin, et al. 2010. Ammonia removal from anaerobic digestion effluent of livestock waste using green alga *Scenedesmus* sp. *Bioresour. Tech.*, 101(22): 8649-8657.
8. Gonzalez, Luz Estela, Rosa Olivia Canizares and Sandra Baena. 1997. Efficiency of ammonia and phosphorus removal from a Colombian agro-industrial wastewater by the Microalgae *Chlorella vulgaris* and *Scenedesmus dimorphus*. *Bioresour. Tech.*, 60(3): 259-262. [https://doi.org/10.1016/S0960-8524\(97\)0029-1](https://doi.org/10.1016/S0960-8524(97)0029-1).
9. Wu, Mei-Yin, Eldon H. Franz and Shulin Chen. 2001. Oxygen fluxes and ammonia removal efficiencies in constructed treatment wetlands. *Water Env. Res.*, 73(6):661-666. <https://doi.org/10.2175/106143001x143394>.
10. Gersberg, R.M., et al. 1986. Role of aquatic plants in wastewater treatment by artificial wetlands. *Water Res.*, 20(3):363-368. [https://doi.org/10.1016/0043-1354\(86\)-90085-0](https://doi.org/10.1016/0043-1354(86)-90085-0).

11. Rezakazemi, Mashallah, Saeed Shirazian and Seyed Nezameddini Ashrafizadeh. 2012. Simulation of ammonia removal from industrial wastewater streams by means of a hollow-fiber membrane contactor. *Desalination*. 285:383-392. <https://doi.org/10.1016/j.desal.2011.10.030>.
12. Hasanoglu, A., et al. 2010. Ammonia removal from wastewater streams through membrane contactors : Experimental and theoretical analysis of operation parameters and configuration. *Chem.Eng.J.*, 160(2):530-537.
13. Pressley, Thomas A., Dolloff F. Bishop and Stephanie G. Roan. 1972. Ammonia nitrogen removal by breakpoint chlorination. *Env. Sci. and Tech.*, 6(7):622-628.
14. M, W.T., et al. 2012. Removal of total ammonia nitrogen (TAN) nitrate and total organic carbon (TOC) from aquaculture wastewater using electrochemical technology : A review. *Desalination*. 285:1-13. <https://doi.org/10.1016/j.desal.2011.09.029>.
15. Booker, N., E. Cooney and A. Priestley. 1996. Ammonia removal from sewage using natural Australian zeolite. *Water Sci. and Tech.*, 34(9):17-24. [https://doi.org/10.1016/S0273-1223\(96\)00782-2](https://doi.org/10.1016/S0273-1223(96)00782-2).
16. Wang, Yuqiu, et al. 2006. Ammonia removal from leachate solution using natural Chinese clinoptilolite. *J. Hazard. Mater.*, 136(3):735-740.
17. Lin, Zhongfang Lei, et al. 2013. Adsorption mechanisms of high levels of ammonium onto natural and NaCl-modified zeolites. *Separation and Purification Tech.*, 103:15-20. <https://doi.org/10.1016/j.seppur.2012.10.005>.
18. Liu, Chuan-Hsia and Kwang victor Lo. 2001. Ammonia removal from composting leachate using zeolite. J. Characterization of the zeolite. *J. Env. Sci. and Health. Part A*. 36(9). <https://doi.org/10.1081/ESE-100106251>.
19. Gaouar. Yadi, M., et al. 2016. Adsorption of ammonia from wastewater using low-cost bentonite/chitisan beads. *Desalination and water treatment*. 57(45). <https://doi.org/10.1080/19443994.2015.1119747>.
20. Halim, Azhar Abdul, et al. 2010. Comparison study of ammonia and COD adsorption on zeolite, activated carbon and composite materials in landfill leachate treatment. *Desalination*. 262(1):31-35. <https://doi.org/10.1016/j.desal.2010.05.036>.
21. Hussain, Sabir, et al. 2007. Physico-chemical method for ammonia removal from synthetic wastewater using lime stone and GAC in batch and column studies. *Bioresour. Tech.*, 98(4):874-880. <https://doi.org/10.1016/j.biotech.2006.03.003>.
22. Liu, Haiwei, et al. 2010. Screening of novel low-cost adsorbents from agricultural residues to remove ammonia nitrogen from aqueous solution. *J. Hazard. Mater.*, 178. <https://doi.org/10.1016/j.hazmat.2010.01117>.
23. Zhao, Yingxin, et al. 2012. Adsorption of high ammonia nitrogen from wastewater using a novel ceramic adsorbent and the evaluation of the ammonia-adsorbed-ceramic as fertilizer. <https://doi.org/10.1016/j.jcis.2012.10.028>.
24. Ahmad, Zubair, Ki-pal kim and Jaewon shin. 2016. Kinetic, thermodynamic and equilibrium studies for adsorption of ammonium ion on modified polyurethane. *Desalination and water treatment*. 57(32). <https://doi.org/10.1080/19443994.2015.1067834>.
25. Dhoble, Yogesh Nathuji and Sirajuddin Ahmed. 2018b. Review on the innovative uses of steel slag for waste minimization. *J. Mater. Cycles and Waste Manage.*, 1-10. <https://doi.org/10.1007/s10163-018-0711-z>.
26. Liu, Sheng-Yu, et al. 2010. Adsorption intrinsic kinetics and isotherms of lead ions on steel slag. *J. Hazard. Mater.*, 173(1):558-562.
27. Dhoble, Yogesh Nathuji and Sirajuddin Ahmed. 2017. Removal of phenol, ammonia and thiocyanate either alone or in combination by the adsorption with steel slag. *Int. J. Eng. Res. and Develop.*, 13(12):2278-67. https://www.researchgate.net/profile/Yogesh_Dhoble2/publication/322065491_Removal_of_phenol_Ammonia_And_Thiocyanate_Either_Alone_or_in_Combination_by_the_Adsorption_with_steel_slag/links/5a422786aca272d2945701b5/Removal_of_phenol_Ammonia_And_Thiocyanate_E.

28. Dhoble, Yogesh Nathuji and Sirajuddin Ahmed. 2018a. Column studies for the simultaneous removal of phenol, ammonia and thiocyanate by the adsorption with steel slag. *Int. J. Res. in Appl. Sci. and Eng. Tech.*, 2321-9653. www.ijraset.com.
29. Drizo, Aleksandra, et al. 2006. Phosphorus removal by electric arc furnace steel slag and serpentinite, *Water Res.*, 40(8):1547-1554. <https://doi.org/10.1016/j.watres.2006.02.001>.
30. Karanifil, Tanju, et al. 2006. Physico-chemical processes. *Water Env. Res.*, 78(10):1193-1260. <https://doi.org/10.2175/106143006x119198>.
31. Grenoble, Zlata, et al. 2007. Physico-chemical processes. *Water Env. Res.*, 79(10):1228-1296. <https://doi.org/10.2175/106143007x218395>.
32. Markou, Giorgos, Dries Vandamme and Koenraad Muylaert. 2014. Using natural zeolite for ammonia sorption from wastewater and as nitrogen releaser for the cultivation of *Arthrospira platensis*. *Bioresour. Tech.*, 155 (March):373-378. <https://doi.org/10.1016/j.biotech.2013.12.122>.
33. Akasaka, M., et al. 2005. Distribution of Fe³⁺ in a synthetic (Ca, Na)₂(Mg,Fe³⁺)Si₂O₇-Melilite:57 Fe Mossbauer and x-ray rietveld studies. *J. Mineralogical and petrological Sci.*, 100. http://rruff.info/doclib/jmps/vol100/JMPS100_229.pdf.
34. Jeffrey, Post, Bish David and Heaney Peter. 2007. Synchrotron powder x-ray diffraction study of the structure and dehydration behaviour of sepiolite. *Am. Mineralogist.* 92:91-97. <https://doi.org/10.2138/am.2007.2134>.
35. Antao, Sytle M. and Ishmael Hassan. 2010. Temperature dependence of the structural parameters in the transformation of aragonite to calcite, as determined from in situ synchrotron powder x-ray diffraction data. *The Canadian Mineralogist.* 48(5). [http://canmin.geoscienceworld.org/content/48/5/1225/figures only](http://canmin.geoscienceworld.org/content/48/5/1225/figures%20only).
36. Onac, Bogdan P., et al. 2006. Hydroxyllellstadite from Cioclovina Cave (Romania) : Microanalytical structural and vibrational spectroscopy vibrational spectroscopy data. *Am. Mineralogist.* 91(11-12). <http://ammin.geoscienceworld.org/content/91/11-12/1927>.
37. Evans, Bernard W. and Hexiong. Yang. 1998. Fe-Mg order-disorder tremolite-actinolite-ferro-actinolite at ambient and high temperature. *Am. Mineralogist.* 83(5-6). <http://ammin.geoscienceworld.org/content/83/5-6/458>.
38. Qiu, Ruifang, et al. 2015. Adsorption kinetics and isotherms of ammonia-nitrogen on steel slag. *Desalination and Water Treatment.* 55(1). <https://doi.org/10.1080/19443994.2014.912154>.
39. Liu, Haiwei, et al. 2010. Ammonium adsorption from aqueous solutions by strawberry leaf powder : Equilibrium, kinetics and effects of coexisting ions. *Desalination.* 263(1-3):70-75. <https://doi.org/10.1016/j.desal.2010.06.040>.
40. Jung, Eun-Jin, et al. 2010. A study on the interfacial tension between solid iron and CaO-SiO₂-MO system. *J. Materials Sci.*, 45(8):2023-2029. <https://doi.org/10.1007/s10853-009-3946-1>.
41. Saraf, Sukhada and Varsha K. Vaidya. 2016. Elucidation of sorption mechanism of *R. Arrhizus* for reactive blue 222 using equilibrium and kinetic studies. *J. Microbial and Biochemical Tech.*, 8(3). *OMICS Int.*, 236-246. <https://doi.org/10.4172/1948-5948.1000292>.
42. Gromping, Ulrike. 2011. Tutorial for designing experiments using the R package remdr Plugin. DoE. Berlin. http://www1.beuth-hochschule.de/FB_II/reports/Report-2011-004.pdf.

Habitat Diversity And Vegetation Communities Of Lake Kondakarla

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Habitat diversity and vegetation communities of Lake Kondakarla, Visakhapatnam district, Andhra Pradesh were studied between December 2014 to January 2017. The lake environments harbour four distinct types of habitat diversity : wet meadows of lake fringes, littoral shallow areas, limnetic open waters and euphotic deep water areas. A total of 24 plant species belongs to 15 families consisting 4-species of emergent forms, 6-species of floating-leaved, 9-species of free-floating and 5-species of the submerged category were enumerated from Kondakarla lake habitats. Relative abundance of plant species indicates that emergent species (84.60%) and free-floating macrophytes (52.12%) were the dominant group rather than floating-leaved (45.43%) and submerged hydrophytes (36.50%) in lake habitats. Maturity index (MI) of plant communities shows that vegetation communities ecological succession was highest at littoral (42.75) and limnetic (27.33) habitats.

Keywords

Kondakarla lake, Habitat diversity, Vegetation community, Hydrophytes, Maturity index

References

1. Seshavataram, V and P. Chandramohan. 1984. Limnological studies on Kondakarla lake-A freshwater body near Visakhapatnam. Technical report. UGC Research Scheme. Andhra University, Waltair.
2. Chandrasekhar, S.V.A, S.Z. Siddiqi. 2004. Kondakarla lake-A toxoecological profile. Rec. Zoological Survey of India. 104 (3-4):63-76.
3. Jagatheeswari, K., B. Kishore and P. S. Raja Sekhar. 2016. Fish diversity and conservation aspects in an aquatic ecosystem, Kondakarla freshwater lake, Visakhapatnam. Int. J. Fisheries and Aquatic Studies. 4(1):20-23.
4. Bharatha Lakshmi, B., B.T Rao and L.M. Rao. 2001. Avifauna of Kondakarla lake near Visakhapatnam, Andhra Pradesh. J. Nature Conservation. 13(1):107-115.
5. Ramachandran, T.V. and N. Ahalya. 2002. Monograph on essentials in limnology and geographic information systems (GIS). Aquatic Ecosystems-Karnataka Research Foundation (KERF). (4):118.
6. Pichi-Sermolli, R. 1948. An Index for establishing the degree of Maturity in plant communities. J. Ecology. 36:85-90.
7. Seshavatharam, V. 1982. An ecological study of fresh water wetlands in relation to lake Kolleru and lake Kondakarla. National Seminar on Resources development and environment of the Eastern Ghats.

Assessment Of Spatio-Temporal Variation In Pond Water Quality: A Case Study

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The aim of the present study was to assess the spatial and temporal variations in pond water quality of Amritsar district of Punjab. The water quality data was collected during the winter (January 2016) and summer season (May 2016) from eleven different sampling sites. Eighteen water quality parameters, like alkalinity, hardness, electrical conductivity (EC), biological oxygen demand (BOD), chemical oxygen demand (COD), dissolved oxygen (DO), pH, total dissolved solids (TDS), Ca, Mg, NO₃⁻, NO₂⁻, PO₄³⁻, SO₄²⁻, etc., were evaluated. The water quality data was then analyzed using multivariate statistical tools including factor analysis, cluster analysis and Pearson correlation. The results of cluster analysis divided the sites into three different clusters on the basis of pollution load during the seasons. Overall the study showed that the water was polluted by anthropogenic activities, like the dumping of municipal and domestic waste and various agricultural activities. The study also revealed that multivariate statistical tools are important for understanding complex data sets for the assessment of water quality.

Keywords

Ponds, Physico-chemical parameters, Multivariate statistical techniques, Spatial and temporal variation

REFERENCES

1. Tripathi, A., A.K. Mishra and G. Verma. 2016. Impact of preservation of subsoil water act on groundwater depletion : the case of Punjab. *Env. manage.*, 58(1) : 48-59.
2. Taoufik, G., I. Khouni and A. Ghrabi. 2017. Assessment of physico-chemical and microbiological surface water quality using multivariate statistical techniques: a case study of the Wadi El-Bey river, Tunisia. *Arabian J. Geosci.*, 10(7) : 181.
3. Singh, K. P., et al. 2004. Multivariate statistical techniques for the evaluation of spatial and temporal variations in water quality of Gomti river (India) - a case study. *Water Res.*, 38 : 3980–3992.
4. Chakraborti, D., B. Das and M.T. Murrill. 2010. Examining India's groundwater quality management.
5. Thilaga, A., et al. 2005. Studies on nutrient content of the Ooty Lake with reference to pollution. *Nature, Env. and Poll. Tech.*, 4 : 299-302.
6. Dwivedi, B.K. and G.C. Pandey. 2002. Physico-chemical factors and algal biodiversity of two ponds (Girija Kund and Maqu-bara pond), Faizabad. *Poll. Res.*, 21: 361-370.
7. Iwama, G. K., M. M. Vijayan and J. D. Morgan. 2000. The stress response in fish. In *Ichthyology, recent research advances*. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi. pp 453.
8. Kolekar, S.S. 2017. Physico-chemical analysis of ground water quality parameters—a review. *J. Chem. and Pharmaceutical Sci.*, 10 : 376-378.
9. APHA, AWWA, WPCF. 2012. Standard methods for the examination of water and wastewaters (22nd edn). American Public Health Association, American water works Association and water pollution control Federation. Washington DC, USA.
10. Agarwal, A.K and G.S. Rajwar. 2010. Physico-chemical and microbiological study of Tehri dam reservoir, Garhwal Himalaya, India. *J. Am. Sci.*, 6(6) : 65-71.
11. Okonko, I.O., et al. 2008. Comparative studies and microbial risk assessment of different ready-to-eat (RTE) frozen sea-foods processed in Ijora-olopa, Lagos State, Nigeria. *African J. Biotech.*, 7(16).

12. BIS. 1992. Specification, ISDW. Bureau of Indian Standards, New Delhi.
13. Sawyer, C.H. 1960. Chemistry for sanitary engineers. McGraw Hill Book Company, New York, USA.
14. Cox, L.J. and M. Fox. 2003. Agriculturally based leisure attractions. J. Tourism Studies. 14(1) : 49.
15. Shinde, S.E., et al. 2010. Seasonal variations in physico-chemical characteristics of Harsool - Savangi Dam, district Aurangabad. The Ecoscan (NEA). 4(1) : 37-44.
16. Smolders, A. J. P., et al. 2010. How nitrate leaching from agricultural lands provokes phosphate eutrophication in groundwater fed wetlands : the sulphur bridge. Biogeochemistry. 98 : 1-7.
17. Lamers, L.P.M., H.B.M. Tomassen, J.G.M. Roelofs. 1998. Sulphate-induced eutrophication and phytotoxicity in freshwater wetlands. Env. Sci. and Tech., 32 : 199-205.
18. Vega, M., et al. 1998. Assessment of seasonal and polluting effects on the quality of river water by exploratory data analysis. Water Res., 32 (12): 3581- 3592.

To Determine Concentration Of Pollution And Dissolved Oxygen In River Water Using Fractional Advection-Diffusion Equation Through Sumudu Transform

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In the present research paper, we have used the Sumudu transform to solve the fractional advection-diffusion equation. This type of diffusion equation is most useful to calculate the concentration of pollution and dissolved oxygen in the river water. The Caputo fractional derivative to diffusion equation was used and solved through Sumudu transform. These results prove that the Sumudu transform is really useful and applicable for finding solutions to the problems related to the concentration of pollution and dissolved oxygen in the river water.

Keywords

Sumudu transform, Fractional advection-diffusion equation, Riemann Liouville fractional derivative, Chemical parameters, Water pollution, Mittag-Leffler function

References

1. Debnath, L. and D. Bhatta. 2007. Integral transforms and their applications. Chapman and Hall/CRC, Taylor and Francis Group, New York.
2. Darzi, R., et al. 2013. Sumudu transform method for solving fractional differential equations and fractional diffusion-wave equation. J. Mathematics and Computer Sci., 6:79-84.
3. Belgacem, F.B.M. and A.A. Karaballi. 2006. Sumudu transform fundamental properties investigations and applications. J. Appl. Mathematics and Stochastic Analysis. 23.
4. Belgacem, F.B.M., A.A. Karaballi and S.L. Kalla. 2003. Analytical investigations of the Sumudu transform and applications to integral production equations. Mathematical Problems in Eng., 3:103-108.
5. Bodhkhe, D.S. and S.K. Panchal. 2016. On Sumudu transform of fractional derivatives and its applications to fractional differential equations. Asian J. Mathematics and Computer Res., 11(1):69-77.
6. Pimpunchat, B., et al. 2009. Mathematical model for pollution in a river and its remediation by aeration. Appl. Mathematical. Letters. 22:304.
7. Husain, Saleem Azara. 2012. Mathematical model for the concentration of pollution and dissolved oxygen in the Diwaniya river (Iraq). Am. J. Scientific Res., 78 (October).
8. Bhadane, Pradip R. and Kirtiwant P. Ghadke. 2016. Solution of advection-diffusion equation for concentration of pollution and dissolved oxygen in the river water by Elzaki transform. Am. J. Eng. Res., 5(9):116-121.
9. Gomez-Aguilar, J.F., et al. 2016. Fractional Linard type model of a pipeline within the fractional derivative without singular kernel. Advances in Difference Equations. (1):1-13.
10. Morales-Delgado, V.F., et al. 2016. Laplace homotopy analysis method for solving linear partial differential equations using a fractional derivative with and without kernel singular. Advances in Differences Equations. 164.
11. Wu, G.C., et al. Discrete fractional diffusion equation. Nonlinear Dynamics. 80(1-2):281-286.
12. Gomez-Aguilar, J.F., et al. 2016. Modeling diffusive transport with a fractional derivative without singular kernel. Physica A. Statistical Mechanics and its Applications. 447, 467-481.
13. Morgado, M.L. and M. Rebelo. 2015. Numerical approximation of distributed order reaction diffusion equations. J. Computational and Appl. Mathematics. 275:216-227.

14. Cremeansa, M.M., et al. 2018. Application of new point measurement device to quantify groundwater-surface water interactions. *J. Contaminant Hydrology*. 211:85-93.

Rainwater Harvesting Strategy For The Kolkata Metropolitan Area

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There is no doubt that water scarcity is a problem, not only confined to the global scale but also to regional scales. Narrowing the issue to our country India, more so for the state of West Bengal, the issue is quite alarming. As a whole, the condition of the state of West Bengal is quite dismal as far as the availability of groundwater is concerned. One of the solutions to mitigate this issue happens to be rainwater harvesting. The present pilot study relates to the feasibility of rainwater harvesting as a probable solution to the increasing water demand for the metropolis Kolkata, particularly with respect to one of the sectors, such as the residential sector. This paper presents a comprehensive study of integrated management including issues and challenges for maximum possible utilization of rainwater for the mentioned residences to reduce the water requirement from the Kolkata Municipal Corporation (KMC) and groundwater sources.

Keywords

Rainwater harvesting, Precipitation, Water quality parameters, Artificial recharge

REFERENCES

1. Sivanappan, R.K. 2006. Rainwater harvesting, conservation and management strategies for urban and rural sectors. National Seminar on Rainwater harvesting and water management. Proceedings, pp 1-5.
2. Bhavsar, Charu and Pradeep Bhalge. 2006. Rooftop rainwater harvest-A long lasting solution to drive away the need of water tankers. National Seminar on Rainwater harvesting and water management. Proceedings, pp 83-90.
3. Agarwal, Vijaya and J.H. Agarwal. 2006. Water issues and related concerns. National Seminar on Rainwater harvesting and water management. Proceedings, pp 6-9.
4. Deshmukh, Sandip H. and R.B. Magar. 2006. The scope or rainwater harvesting in urban areas. National Seminar on Rainwater harvesting and water management. Proceedings, pp 45-55.
5. Gandhi, Vasant P. and Vaibhav Bhamoriya. 2011. Rainwater harvesting for irrigation in India potential. Actions and performances. National Seminar on Rainwater harvesting and water management. Proceedings, pp 118-133.
6. Kirloskar, S.G. 2006. Rainwater harvesting and water management. National Seminar on Rainwater harvesting and water management. Proceedings, pp 65-69.
7. Singh, P.K., Bhaskar Singh and B.K. Tewary. 2006. Rooftop rainwater harvesting for artificial recharge to ground water : An urgent need of present century. National Seminar on Rainwater harvesting and water management. Proceedings, pp 78-82.
8. Asati, S.R. and Abhijit Deshpande. 2006. Importance of rainwater harvesting in current scenario. National Seminar on Rainwater harvesting and water management. Proceedings, pp 117-122.
9. Balasubramanya, N. 2006. Harvested rainwater for drinking. National Seminar on Rainwater harvesting and water management. Proceedings, pp 16-19.
10. Stiefel, John M., et al. 2009. Effects of rainwater-harvesting-induced artificial recharge on the groundwater of wells in Rajasthan. Hydrogeology J., 17:2061-2073.

11. Patel, Utsav R., et al. 2014. Rooftop rainwater harvesting (rrwh) at SPSV campus, Visnagar, Gujarat-A case study. Int. J. Res. in Eng. and Tech., 3(4) : 821-825.

Are We Taking Poison Every Day?

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References

1. Radwan, M.A. and A.K. Salama. 2006. Market basket survey for some heavy metals in Egyptian fruits and vegetables. *Food and Chem. Toxicology*. 44:1273-1278.
2. Maleki, A. and M.A. Zarasvand. 2008. Heavy metals in selected edible vegetables and estimation of their daily intake in Sanandaj, Iran. *The Southeast Asian J. Tropical Medicine and Public Health*. 39(2):335-340.
3. Wong, C.S.C., et al. 2003. Atmospheric depositions of heavy metals in the Pearl river delta, China. *Atmos. Env.*, 37:767-776.
4. Marshall. 2004. Enhancing food chain integrity : Quality assurance mechanism for air pollution impacts on fruits and vegetables systems. Crop Post Harvest Programme. Final technical report (R 7530).<<http://www.sussex.ac.uk/spru/1-4-7-1-11-1.html>>.
5. Oves, M., et al. 2012. Soil contamination, nutritive value and human health risk assessment of heavy metals : An overview-Toxicity of heavy metals to legumes and bioremediation. Springer.
6. Jarup, L. 2003. Hazards of heavy metal contamination. *Br. Med. Bull.*, 68(1):167-182.
7. Garbarino, J.R., et al. 1995. Contaminants in the Mississippi river. U.S. Geol. Surv. circular, virginia, U.S.A. pp 1133.
8. Jaishankar, M., et al. 2014. Biosorption of few heavy metal ions using agricultural wastes. *J. Env. Poll. and Human Health*. 2(1):1-6.
9. Nagajyoti, P.C., K.D. Lee and T.V.M. Sreekanth. 2010. Heavy metals occurrence and toxicity for plants : A review. *Env. Chemistry Letters*. 8(3):199-216.
10. Akbulut, N.E.A. and A.M. Tuncer. 2011. Accumulation heavy metals with water quality parameters in Kizilirmak river basin (Delice river) in Turkey. *Env. Monit. Assess.*, 173: 387-385.
11. Larison, J.R., et al. 2000. Cadmium toxicity among wildlife in the Colorado rocky mountains. *Nature*. 406:181e 183.
12. Farombi, E.O., O.A. Adelowo and Y.R. Ajimoko. 2007. Biomarkers of oxidative stress and heavy metal levels as indicators of environmental pollution in African cat fish (*Clarias gariepinus*) from Nigeria Ogun river. *Int. J. Env. Res. Public Health*. 4(2):158-165.
13. Vosyliene, M.Z. and A. Jankaite. 2006. Effect of heavy metal model mixture on rainbow trout biological parameters. *Ekologija*. 4:12-17.
14. Ashraj, W. 2005. Accumulation of heavy metals in kidney and heart tissues of *Epinephelus microdon* fish from the Arabian Gulf. *Env. Monit. Assess.*, 101(1-3):311-316.
15. Boran, M. and I. Altinok. 2010. A review of heavy metals in water, sediment and living organisms in the Black sea. *Turkish J. Fisheries and Aquatic Sci.*, 10:565-572. <https://doi.org/10.4194/trjfas.2010.0418>.
16. Ajima, M.N., et al. 2015. Bioaccumulation of heavy metals in Mbaa river and the impact on aquatic ecosystem. *Env. Monit. Assess.*, 187(12):768.doi:10.1007/s10661-015-4937-0. Epub 2015 Nov 23.
17. Velez, D. and R. Montoro. 1998. Arsenic speciation in manufactured seafood products : A review. *J. Food Prot.*, 61(9):1240-1245.

18. Conacher, H.B., B.D. Page and J.J. Ryan. 1993. Industrial chemical contamination of foods (Review). *Food Addit. Contam.*, 10(1):129-143.
19. Forstner, U. and G.T. Whittmann. 1983. *Metal pollution in aquatic environment*. Springer-Verlag, Berlin, Heidelberg, New York, Tokyo. pp 486.
20. He, M., Z. Wang and H. Tang. 2001. Modeling the ecological impact of heavy metals on aquatic ecosystems : A framework for the development of an ecological model. *Sci. Total Env.*, 266(1-3):291-298.
21. Khelifi, R. and A. Hamza-Chaffai. 2010. Head and neck cancer due to heavy metal exposure via tobacco smoking and professional exposure : A review. *Toxicol. Appl. Pharm-acol.*, 248:71-78.
22. Zhang, M.K., Z.Y. Liu and H. Wang. 2010. Use of single extraction methods to predict bioavailability of heavy metals in polluted soils to rice. *Communications in Soil Sci. and Plant Analysis*. 41(7):820-831.
23. Khan, S., et al. 2008. Accumulation of polycyclic aromatic hydrocarbons and heavy metals in lettuce grown in the soils contaminated with long-term wastewater irrigation. *J. Hazard. Mater.*, 152:506-515.
24. Wittmann, G.T.W. and U. Forstner. 1980. Metal enrichment of sediments in inland waters. *Water S.A.* 1:76-82.
25. Reeves, R.D. and A.J.M. Baker. 2000. Metal-accumulating plants. In *Phytoremediations of toxic metals : Using plants to clean up the environment*. Ed I. Raskin and B.D. Ensley. Wiley, New York. pp 193-229.
26. Fernandes, J.C. and F.S. Henriques. 1991. Biochemical, physiological and structural effects of excess copper in plants. *Bot. Rev.*, 57:247-273.
27. Fu, J., et al. 2008. High levels of heavy metals in rice (*Oryza sativa* L.) from a typical e-waste recycling area in southeast China and its potential risk to human health. *Chemosphere*. 71:1269-1275.
28. Hao, X.Z., et al. 2009. Heavy metal transfer from soil to vegetable in southern Jiangsu Province, China. *Pedosphere*. 19(3):305-311.
29. Lorenzon, S., et al. 2001. Heavy metals affect the circulating hemocyte number in the shrimp *Palaemon elegans*. *Fish and Shellfish Immunology*. 11:459-472. doi : 10.1006/fsim.2000.0321.
30. Vutukuru, S.S. 2005. Acute effects of hexavalent chromium on survival, oxygen consumption, hematological parameters and some biochemical profiles of the Indian Major carp, *Labeorohita*. *Int. J. Env. Res. Public Health*. 2(3):456-462.
31. Akan, J.C., et al. 2012. Bioaccumulation of some heavy metals in fish samples from river Benue in Vinikilang, Admawa state, Nigeria. *Am. J. Analytical Chemistry*. 3:727-736.
32. Mitra, A. and R. Ghosh. 2014. Bioaccumulation pattern of heavy metals in commercially important fishes in and around Indian Sundarbans. *Global J. Animal Scientific Res.*, 2(1):33-34.
33. Arantes, V., W. Albuquerque and J.M. Salles. 2013. Effectiveness of unsedated- transnasal endoscopy with white-light, flexible spectral imaging colour enhancement and lugol staining for esophageal cancer screening in high-risk patients. *J. Clin. Gastroenterol.*, 47:314-321.
34. Dutta, J., G. Roy Choudhary and A. Mitra. 2017. Bioaccumulation of toxic heavy metals in the edible fishes of eastern Kolkata wetlands (EKW) the designated Ransar site of West Bengal. *Int. J. Aquaculture and Fishery Sci.*, 18-21.
35. Arora, M., et al. 2008. Heavy metal accumulation in vegetables irrigated with water from different sources. *Food Chem.*, 111:811-815. doi:10.1016/j.food chem. 2008.04049.
36. Orisakwe, O.E., et al. 2012. Heavy metals health risk assessment for population via consumption of food crops and fruits in Owerri, south eastern Nigeria. *Chem. Cent.J.*, 6:77-83. doi:10.1186/1752153X-6-77.
37. Petroizi and Naughton. 2009. Mercury, cadmium and lead contamination in seafood : A comparative study to evaluate the usefulness of target hazard quotients. *Food Chem. Toxicol.*, 47:298-302. doi:10.1016/j.fct.2008.11.007.
38. Singh, A. and M. Agrawal. 2010. Effects of municipal wastewater irrigation on availability of heavy metals and morphophysiological characteristics of *Beta vulgaris* L. *J. Env. Biol.*, 31:727-736.

39. Zhuang, P., et al. 2009. Heavy metal contamination in soils and food crops around Dabasoshan mine in Guangdong, China : Implication for human health. *Env. Geochem. Health.* 31:707-715.doi:10.1007/s10653-009-9248-3.
40. Mathur, N., P. Bhatnagar and H. Verma. 2006. Genotoxicity of vegetables irrigated by industrial wastewater. *J. Env. Sci., (China).*
41. Flores-Magdaleno, H., et al. 2011. Heavy metals in agricultural soils and irrigation wastewater of mixquiahuala, Hidalgo, Mexico. *Afr. J. Agric. Res.,* 6:5506-5511.
42. Boamponsem, G.A., M. Kumi and I. Debrah. 2012. Heavy metals accumulation in cabbage, lettuce and carrot irrigated with wastewater from Nagodi mining site in Ghana. *Int. J. Sci. Tech. Res.,* 1:124-129.
43. Huang, Z., et al. 2014. Heavy metals in veg etables and the health risk to population in Zhejiang, China. *Food Control.* 36:248-252.
44. Bhattacharyya, S., et al. 2015. *Int. J. Curr. Res. Biosci. Plant Biol.,* 2(5):148-154.
45. Rauf, A., M. Javed and M. ubaidullah. 2009. Heavy metal level in three major carps (Catlacatla, Labeorohita and Cirrhinamrigala) from the river Ravi, Pakistan. *Pak. Vet. J.,* 29(1):24-26.
46. Kumar, B., et al. 2011. Bioaccumulation of heavy metals in muscle tissue of fishes from selected aquaculture ponds in east Calcutta wetlands. *Ann. Biol. Res.,* 2(5):125-134.
47. Mitra, A., K. Banerjee and S. Sinha. 2011. Shrimp tissue quality in the lower Gangetic delta at the apex of Bay of Bengal. *Toxicological and Env. Chemistry.* 93(3):565-574.
48. Mitra, A., R. Choudhury and K. Banerjee. 2012. Concentrations of some heavy meals in commercially important finfish and shelfish of the river Ganga. *Env. Monitoring and Assess.,* 184:2219-2230. SPRINGERDOI 10.1007/s 10661-011-2111-x.
49. Dutta, J., A. Saha and A. Mitra. 2016. Impact of acidification on heavy metal levels of east Kolkata wetlands (EKW), a Ramsar site in the Indian sub-continent. *IJARBS.* 3(11):154-159.
50. Chakraborti, D., et al. 1987. Determination of trace metals in natural waters at nanogram per liter levels by electrothermal atomic absorption spectrometry after extraction with sodium diethyl-dithiocarbamate. *Analytical Chimica Acta.* 196: 23-31.
51. Malo, B. 1977. Partial extraction of metals from aquatic environments. *Env. Sci. and Tech.,* 11:277-282.
52. Nadkarni, R.A. 1984. Applications of microwave oven sample dissolution in analysis. *Anal. Chemistry.* 56:22-23.
53. Matusiewicz, H. and R.E. Sturgeon. 1989. Present status of microwave sample dissolution and decomposition for elemental analysis. *Progress in Analytical spectroscopy.* 12:21.
54. Choi, Y.Y. 2011. International/National standards for heavy metals in food. Government of Hong Kong.
55. Dutta, J., S. Zaman and A. Mitra. 2017. Bioaccumulation of toxic heavy metals in some commonly edible vegetables grown in east Kolkata wetland (EKW), the designated Ramsar site of West Bengal. *Int. J. Health Sci. and Eng.*
56. De la Guardia, M. 1990. Empleo de losHornos de Microondas en Quimica. University of Valencia, Spain.
57. Enoyer, E.R. 1992. Semi-quantitative analysis of environmental materials by laser-sampling inductively coupled plasma mass spectrometry. *J. Analytical Atomic Spectrometry.* 7:1187.

Effective Utilization of Solid Waste, a Rational Approach Under Clean India

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Solid waste is proving to be one of the greatest risks to the general public. In order to conquer this issue, an itemized review within the specialized grounds is needed. The study was conducted in a technical campus (7 divisions) including office cafeteria flask and entire grounds. It has been discovered that the considerable measure of recyclable, non-recyclable and inorganic squanders are created inside the grounds. Recyclable squanders have been appropriately isolated and reused. Appropriate assimilation chamber, like Bangalore and indoor composting strategies are embraced with vermin fertilizing the soil activity for snappy disintegration. The outcomes gathered from the tests performed were issued for proper waste utilization. The task is to make the specialized ground a strong zero waste hatchery.

Keywords

Solid Wastes (SW), British thermal unit (BTU), High density polyethylene (HTPE), Liquefied petroleum gas (LPG), Total suspended solids (TSS), Volatile suspended solids (VSS), Mixed liquor suspended solids (MLSS), Mixed liquor volatile suspended solids (MLVSS), Food to micro organism ratio (F/M), Volatile fatty acid (VFF)

REFERENCES

1. Dowie, W.A., D.M. McCartney and J.A. Tamm. 1998. A case study of an institutional solid waste environmental management system. *Env. Manage.*, 53:137-146.
2. Symth, Danielle P., Arthur L. Freden and Annie L.Booth. 2009. Reducing solid waste in higher education : The first step towards 'greening' a university campus.
3. Gallardo, A., et al. 2016. The determination of waste generation and composition as an essential tool to improve the waste management plan of a university. Department of Mechanical Engineering and Constuction, Jaume University, Av.de Vicent Sos Baynat Castello de la Plana, Spain.
4. Al-Salem, S.M., P. Lettieri and J. Baeyns. 2009. Recycling and recovery routes of plastic solid waste (PSW).
5. Albasha, Mohamed Omer, P. Gupta and P.W. Ramteke. 2015. Management of kitchen waste by vermicomposting using earthworm. *Eudrilus Eugeniae*.
6. Mohammed Haneef, M.V., A. Lilly Joice and D. Niranjana. 2017. Synthesis and comparative analysis of natural gas from the sheep droppings as main admixture and food waste as a partial admixture in a confined built digester. *J. Chem. and Pharmaceutical Res.*, 9(11).
7. Mohammed Haneef, M.V., A. Lilly Joice and D. Niranjana. 2018. Natural gas production from batch feeding of sheep droppings as main admixture and food waste as a partial admixture in a confined batch digester. *Int. J. Chem. Res.*, 11(3).
8. Cristelo, Nuno, Castorina Silva Viera and Maria de Lurdes Lopes. 2016. Geotechnical and governmental assessment of recycled construction and demolition waste for food embankments.
9. Ounnar, Amel, Lamia Benhabyles and Sadek Igoud. 2012. Energetic valorization of biomethane produced from cow dung. *Procedia Eng.*, 33:330-334.
10. Intermediate ozonation to enhance biogas production in batch and continuous systems using animal dung and agricultural waste. 3rd November, 2016. Elsevier.

11. Ahmad, Sanaullah, Khalid Mahmood and Muhammad Anas. 2015. Designing and strategic cost estimation of biogas plant : An alternative for current energy crisis in Pakistan.
12. MoEf, F. 2016. Construction and demolition waste management rules : e-waste (Management) Rules, 2016, Plastic Waste Management Rules 2016.
13. Patriarca, Riccardo, et al. 2016. The functional resonance analysis method for a systemic risk based environmental auditing in a sinter plant.



Ecological status and conservation of Kondakarla freshwater lake, Visakhapatnam district, Andhra Pradesh, India

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Abstract

Studies on water quality, habitat conditions and aquatic vegetation were assessed between December, 2014 and January, 2017 to know the present ecological status and state of environment of Kondakarla lake. Habitat of the lake environments were distributed into: (i) wet meadows; (ii) littoral shallow waters ;(iii) limnetic open waters and (iv) euphotic lake bed areas. Aquatic vegetation was classified into: (a) emergent forms; (b) floating leaved; (c) submerged; and (d) free-floating hydrophytes. A total of 24 aquatic plants consisting: 4-species emergent forms; 5-species floating leaved; 7-species submerged macrophytes and 8-species free-floating hydrophytes were enumerated from lake habitats. Among these, the submerged and free floating hydrophytes were the dominant group (63.0%) rather emergent and floating leaved category (37.0%). The phosphates(P) were recorded in highest amounts (15-40 mg/l) and nitrates (N) were shown in lowest ranges (2.2 to 4.3 mg/l) in lake waters. The ecological status indicate that lake environments are at advanced stages of eutrophication due to changes in water quality, composition of aquatic communities and degradation of habitats. Conservation strategies have been formulated for restoration of Kondakarla lake ecosystem.

Keywords: Kondakarla Lake, ecological study, aquatic vegetation, eutrophication and conservation

1. Introduction

Wetlands in India occupy 58 million hectares and estimated that fresh water wetlands alone support 20 percent of the known range of bio-diversity in India. Today wetlands (naturals or human modified) provide staple food (rice and fish) for more than half of the world's human population. In spite of several benefits that fresh water wetlands have become prime targets from many human activities and now they are listed in threatened status category (Deepa and Ramachandra, 1999) ^[1]. Over-exploitation of wetland biological resources causes decline of many species (plants & animals) and reclamation of lake areas for construction of fish ponds, agriculture practices combined with pollution due to agrochemicals and industrial effluents has resulted eutrophication (Gopal, 1995) ^[6] of lake ecosystems.

Earlier studies on Kondakarla freshwater lake were mostly focused on Aquatic Plant Communities (Seshavataram, 1982); Ecological assessment & Ecotourism development (Jayathi, 2001) ^[8]; Taxoecological (Chandrasekhar and Siddiqi, 2004) ^[2]; Ichthyofaun (Chandrasekhar, 2003) ^[3] and Biodiversity of faunal groups (Jagatheeswari, 2012) ^[7]. However studies related to present ecological status and eutrophication are lacunae. Therefore, an attempt has been made to assess the present ecological status of Kondakarla freshwater lake through evaluation of water quality, habitat conditions and vegetation communities in order to suggest conservation measures for restoration and management of important natural resources of lake Ecosystem.

2. Materials and Methods

2.1.1 Study area & Geography

Kondakarla lake is a freshwater lake spread to an area of 6.5 Sq.km situated between 17°36'38"N latitudes and 82°59'53"E longitudes in Visakhapatnam district of Andhra Pradesh, India (Figure 1). It is classified under lacustrine of littoral category encompassed by small hillocks of Eastern ghats and vast plains interspersed by tree species such as *Cocos nucifera*, *Borassus flabellifer*, *Acacia nilotica* and *Azadirachta indica* with dense growth of shrub and herbaceous communities are of typical coastal littoral vegetation. The lake received freshwater flows through an inlet Munagapaka channel of Sarada river and flooded waters in rainy season reached to the Bay of Bengal by creeks, which is about 10 km distance from the lake. The details of geographical and physical features of Kondakarla are given Table 1.

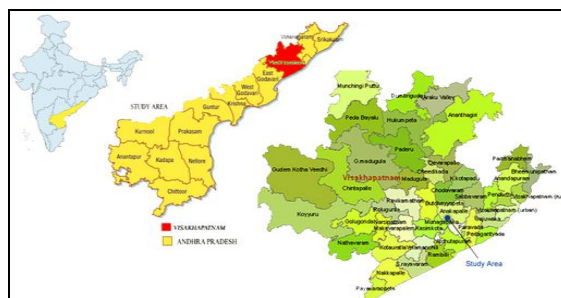


Fig 1: Map showing the location of Lake Kondakarla in Visakhapatnam district, Andhra Pradesh, India

Table 1: Details of geography and physical features of lake Kondakarla

Lake parameters	Characteristic Features
Geographical location	17°36'38" N Latitude & 83°08'53" E longitude
Area (Hectares)	450 (4.5 Sq.km)
Maximum depth(meters)	0.5 to < 3.5
Surface temp (°C)	22.0 – 38.5
Lake type of origin	Riverine- Lacustrine system
Bottom type	Silt & clayey-Muddy-soft bottom
Dominant vegetation	Macrophytes and Submerged hydrophytes

2.1.2 Distribution of lake habitats

Survey of the lake environments was conducted during the period from December, 2014 to January, 2017 in a country made dugout canoe of Palmyra tree (*Borassus flabellifer*) for water quality analysis, studying the habitat features, distribution patterns and vegetation communities. As per the descriptions of Ramachandran and Ahalya (2002) [9] the lake environments are categorized in to four habitats: (i) wet meadows of lake fringes: (ii) littoral shallow waters; (iii) limnetic open waters and (iv) euphotic deep waters.

2.1.3 Vegetation analysis

Aquatic vegetation of lake was classified into: (I) Rooted plants attached to the substratum divided into: (a) Emergent forms: (b) Floating leaved: (c) Submerged and (II) Non-rooted category are: (d) Free floating hydrophytes. Plant species identification was done after verification with voucher specimens of herbarium collections in the Dept. of Botany, Andhra University, Visakhapatnam.

2.1.4 Threats and water pollution

Threats to Kondakarla lake related to human impacts, water pollution and other factors were assessed on a 10.0 point scale (between 1.0 and 10.0) and converted into their percentage

Table 3: Habitat types, hydrological features and wetland communities of Lake Kondakarla

Habitat type	Hydrological features	Water depth (meters)	Wetland community	Dominant vegetation
(i) Fringes	Wet meadows	<1.0m	Emergent marsh	<i>Typha, Ipomoea</i>
(ii) Littoral	Shallow waters	1.0 to 2.0m	Free floating	<i>Pistia, Lemna</i>
(iii) Limonitic	Surface waters	2.0 to 3.0m	Floating leaved	<i>Nymphaea, Ludwigia</i>
(iv) Benthic	Lake bed areas	>3.0m	Submerged	<i>Hydrilla, Chara</i>

3.3 Vegetation communities

A total of 24 aquatic plant species belongs to 15 families consisting: (a) emergent forms, 4-species; (b) floating leaved, 5-species; (c) submerged plants, 7-species and (d) free-floating macrophytes, 8-species were enumerated from lake habitats. Among these, the submerged and free floating category were the dominant group (63.0%) rather emergent and floating leaved (37.0%) hydrophytes (Table 4).

Distribution of aquatic communities shows variation among lake habitats: (i) The emergent species were in highest density at lake fringes, (iii) free floating hydrophytes were abundant in littoral shallow areas, (ii) floating leaved plants were closely associated to limnetic waters at a depth of about 0.25

contributions. The water quality parameters were analyzed and correlated as per the standards of APHA, (2005) [1].

3. Results and discussion

3.1 Lake water quality

The physico-chemical parameters of lake waters indicated that a water depth between 0.4 to 3.0 meters, dissolved oxygen (DO) levels 2.5 to 5.6 mg/l, water temperatures between 27.3-35.2°C, pH ranges are fluctuated from 4.0 to 9.2 was observed during summer and rainy months. The organic nutrients of phosphates (P) were recorded highest between 15 and 40 mg/l during rainy and winter months and nitrates (N) were fluctuated from 1.5 to 4.3 mg/l in all the seasons (Table 2)

Table 2: Water analysis of physico-chemical parameters of Kondakarla lake.

Temp (°C)	Depth (meters)	Phosphates (mg/l)	Nitrates (mg/l)	pH	DO(mg/l)
27.3-38.2	0.5-<3.0	15 to 40	1.5-4.2	4.0 to 9.2	2.5 to 5.6

3.2 Habitats category

The lake habitats were recognized into: (i) Wet meadows are the shallow water areas of lake fringes occupied by dense thickets of emergent forms of *Typha angustata* and *Scirpus articulata*; (ii) Littoral shallow waters of the near shore areas, where sunlight penetrates up to the lake substratum with thick mats of free floating hydrophyte species: *Nechamandra alternifolia*, *Hydrilla verticillata* and *Limnophila indica*; (iii) Limnetic open waters, where sun light does not reached to the bottom contains dense growth of floating leaved macrophytes: *Nymphaea nouchali* and *Aponogeton crispus*; (iv) Euphotic area of lake bed occupied by sparse floating leaved and dense submerged hydrophytes, *Vallisneria spiralis*, *Najas graminea* and *Ottelia alismoides*. The description of habitat types and wetland communities are given in Table 3.

to 2.50 meters (iv) Submerged hydrophytes were observed at deep waters of 3.0 meters depth in euphotic lake bed areas As per findings of Seshavataram (1982) that Kondakarla lake support a good macrophytic vegetation of 20 species due to its muddy bottom with rich organic matter. Chandra Sekhar and Siddiqi (2005) recorded 26 species include two rare species *Alternanthera sessilis* and *Ipomoea fistula*. These findings are supporting to our observations that lake Kondakarla contains diversified flora of 24 species with important endemics such as: *Scirpus articulatus*; *Ottelia alisimoides*; *Vallisneria spiralis* and *Nymphaea nouchali*. However, the species *Utricularia stellaris* and *Utricularia speciosa* were absent and inconspicuous in lake waters.

Table 4: Vegetation communities and associated plant species in Kondakarla Lake

Community	Family wise	Scientific name	Common name
I. Plants attached to the substratum:			
a) Emergent Forms:	Cyperaceae	<i>Scirpus articulatus</i>	Bull rush
		<i>Elacocharis plantaginea</i>	Water Chestnut
	Polygonaceae	<i>Polygonum glabrum</i>	Dense lower Knot weed
	Typhaceae	<i>Typha aungustata</i>	Reed mace
b) Floating leaved:	Aponogetonaceae	<i>Aponogeton crispus</i>	Wavy edged grass
	Nymphaeaceae	<i>Nymphaea nouchali</i>	Star lotus-water lilly
	Menyanthaceae	<i>Nymphoides indica</i>	Water snow flake
	Onagraceae	<i>Ipomoea aquatic</i>	Water spinach
		<i>Ludwigia adscendens</i>	Water prime rose
c) Submerged Macrophytes:	Characeae	<i>Chara vulgaris</i>	Common vulgaris
	Hydrocharitaceae	<i>Hydrilla verticillata</i>	Indian star grass
		<i>Ottelia alismoides</i>	Duck lettuce
		<i>Nechamandra alternifolia</i>	Indian elodea
	Fabacea	<i>Neptunia oleracea</i>	Sensitive water plant
	Najadaceae	<i>Najas graminea</i>	Water nymph
		<i>Vallisneria spiralis</i>	Tape /Eel grass
II. Plants not attached to substratum:			
d) Free floating:	Araceae	<i>Spirodela polyrhiza</i>	Duck weed
	Salviniaceae	<i>Pistia stratiotes</i>	Water lettuce
		<i>Azolla filiculoides</i>	Water fern
		<i>Limnophila indica</i>	Marsh weed
	Lemnaceae	<i>Salvinia auriculata</i>	Butterfly fern
		<i>Lemna perpusilla</i>	Common duck weed
	Poaceae	<i>Pseudorphis spinescens</i>	Spiny mud grass
		<i>Echinochloa stagnina</i>	Hippo grass

4. Conservation of Kondakarla lake

Before designing the strategies and action plans, it is necessary to identify the human activities and impacts that may alter the lake environments to be considered for developing large lake conservation planning and action plans (Gopal, 1995) [6].

4.1 Human activities

Major human activities and associated impacts to the lake

ecosystem was mainly due to reclamation of lake habitats for intensive agriculture and fish farming practices are estimated that wetland areas reduced from 650 to 460 hectares (area loss 30%) over a period of time. The threats to the lake habitats were identified as: Aquaculture practices 35.0%; Agriculture farming 25.0%; Siltation and Organic matter deposition, 15.0%; Pollution of lake waters (12.0%); Bioresources use (8.0%) and Eco-tourism, 5.0% respectively (Figure 2).

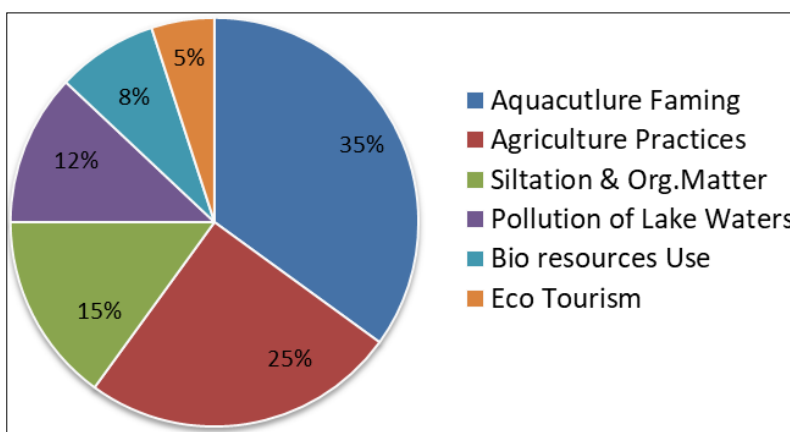


Fig 2: Showing Major Threats for Loss of Kondakarla wetland habitats

4.2 Pollution of lake waters

Even though the lake received national recognition as a wetland habitat for migratory water fowl (Choudhury and Divya, 1995) [4] the lake waters are polluted from sugar

factories and agriculture practices. Besides, a comparison with present and earlier studies revealed that changes were noticed in physico-chemical factors over a period of time are as follows:

Table 3

Water Temp (0 ^c)	Lake depth (meters)	Phosphates (mg/l)	Nitrates (mg/l)	pH	DO (mg/l)	Author/Year
22.0- 32.5	1.0-4.5m	10-30	2.6-9.5	6.0-8.2	3.5-6.8	Seshvatharam (1982)
26.2-34.3	0.5-3.5.m	12-35	2.4-5.3	4.8-9.0	2.3-6.2	Jagtheeswari (2012)
27.3-35.2	0.4-<3.0m	15-40	1.5-4.2	4.0-9.2	2.5-5.6	Present study (2017)

As per Ramachandran and Ahalya (2002) ^[9] observations that in many shallow lakes eutrophication may be manifested in macrophytic growth rather than phytoplankton and efficient utilization of nutrients, which defines growth and biomass production at primary producer level. Further he noticed that lake Kondakarla is greatly influenced by and associated with human activities leading to eutrophication. Similar findings were also observed in our present studies on Kondakarla lake with abundant growth of macrophytes, enrichment of nutrients, human related activities and eutrophication processes in lake Ecosystem. In view of the above the following strategies are recommended for immediate

conservation and management as suggested by Gopal, (1995) ^[6] to the Indian freshwater lakes.

4.1.3 Restoration of lake habitats

1. The silt and organic matter is depositing in the lake bed every year and the depth of the lake is decreasing year by year gradually. To prevent siltation, take up strip dredging and removal of heavy weed growth is the appropriate management interventions.
2. In controlling eutrophication of lake the plant species which are most efficient nutrient removing are recommended to propagate in the lake habitats are as follows:

Table 6

Habitat type	Plant community	Recommended species
Wet meadows :	Emergent forms:	<i>Scirpus articulatus, Typha angustifolia</i>
Littoral slope:	Free floating:	<i>Azolla filiculoides, Salvinia auriculata</i>
Limnetic open:	Floating leaved:	<i>Nelumbo nucifera, Nymphoides indica</i>
Euphotic deep:	Submerged rooted:	<i>Hydrilla verticellata, Najas graminea</i>

3. Kondakarla lake is a naturally formed lake that provides an important biological resource consisting fauna of mollusks, crustaceans and fishes. Therefore rational utilization of bioresources and sustainable ecotourism practiced are to be initiated.

5. Summary and Conclusion

Ecological succession of marsh plant communities were at their climax stages at wet meadows of lake fringes and shallow waters of littoral habitats >Emergent communities < Rooted floating hydrophytes < Free floating < Submerged macrophytes. Further noticed that upland plant species like *Ipomoea cornea* (Pink morning glory) and *Lantana camera* (Sage plant) were established in density and abundance.

Species once commonly found in this wetland are: *Azolla filiculoides*, *Nymphaea stellata*, *Nymphoides indicum*, *Neptunia oleraceae*, *Pseudorhis spinescens* and *Echinochloa staginina* are now become rare and inconspicuous in their presence. The species *Utricularia stellaris*, *Utricularia speciosa*, *Ipomoea fistula* and *Alternanthera sessilis* are reported by earlier studies did not shown their presence and now absent in the lake ecosystem.

6. Acknowledgements

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7. References

1. APHA. Standard Methods for the Examination of Water and Waste Water 21st edition American Public Health Association, 2005.
2. Chandrasekhar SVA, Siddiqi SZ. Kondakarla Lake, Andhra Pradesh- A Toxoecological Profile. Rec Zoological Survey of India. 2004; 104: 3-4, 63-76.
3. Chandrasekhar SVA. Ithyofauna of Kondakarla lake, Andhra Pradesh. Rec. Zool Survey of India. 2003; 101(1-2):1979-1987.
4. Choudhury BC, Divya M. The Wetlands Conservation and Management. Andhra Pradesh- World Bank Forestry Project- Integrated Protected Area System Development. Wildlife Institute of India (WII), Dehradun, 1995.
5. Deepa R, Ramachandhra TV. Impact of Urbanization in the Interconnectivity of Wetlands. Proc in: National Symposium on Remote Sensing Applications for Natural Resources. Indian society of Remote sensing, Bangalore, 1999.
6. Gopal B. Biodiversity in Fresh water Ecosystems including wetlands, Biodiversity and Conservation in India, A Status Report- Zoological Survey of India, (4) Calcutta, 1995.
7. Jagatheeswari K. Habitat Evaluation Studies and Associated Biodiversity of Kondakarla Awa Lake for Conservation and Management in Visakhapatnam Dt. Andhra Pradesh, India. Ph.D thesis, Andhra University, 2012.
8. Jayathi C. Ecological Assessment of Kondakarla wetland, Visakhapatnam for Ecotourism. M. Sc dissertation, Bhopal, 2001, 107.
9. Ramachandran TV, Ahalya N. Monograph on Essentials in Limnology and Geographic Information Systems

(GIS).Aquatic Ecosystems-Karnataka Research Foundation (KERF). 2002(4):118.

10. Seshavatharam V. An Ecological Study of Fresh Water Wetlands in relation to Lake Kolleru and lake Kondakarla. In Proc: National Seminar on Resources Development and Environment of the Eastern Ghats, 1982.

LABOUR PRODUCTIVITY AND ECONOMIC GROWTH IN PUBLIC ORGANIZATION

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ABSTRACT :

Human capital , Physical capital and efficiency generally acts as yardstick for measuring the economic growth of an organization. However human and physical capital are put together used for producing output which as known as productivity. Which is particular important for developing countries. In fact labour productivity plays an important role for the success of any type of organization. This paper provides guidelines to improve labour productivity, efficient utilizing of human capital and impact of training and development on performance and rate productivity. Hence forth the results reveal that there is significant relationship between the employee training and performance. In fact the employee involvement and commitment levels of employees may lead to economic development of the organization.

Key Words: Labour Productivity, Economic Growth.

Introduction:

Human Resource Management is assuming more critical role today due to increase in technology and knowledge base industries and as a result of global competition. Its major accomplishment is aligning individual goals and objectives with corporate goals and objectives. Strategic HRM focuses on actions that differentiate the organization from its competitors and aims to make long-term impact on the success of organization.

Organizational objectives can be achieved by individuals and team efforts. The organizational objectives can be achieved by effective utilization of human resources, by ensuring to recruit and retain personnel in the organization and by developing personnel to Coda, Cesar, A.M.R.V.C., Bido, D.S, and Louffat, E.(2009) defined HRM functions as all the activities and processes involved in the management and development of people in an organization from the period of hiring or acquisition and retention to the point of exit. The functions of HRM include resourcing and retention, compensation and rewards, training and development, performance appraisal, benefits and relations with an employee.

According to Buhler(2002) the functions like recruitment and selection, human resource development, compensation and benefits and safety and health which are used as a key to the management of human resource and for the effective improvement of performance in the organization.

OBJECTIVES :

1. To study the role of training and development on Labour productivity in public organizations .
2. To investigate whether training and development has impact on employees' performance and productivity in public organizations.
3. To study and analyze the factors influencing Labour Productivity.

HYPOTHESIS:

1. Ho1: Training and development has no influence on labour productivity in case of public organization.
Ho2: Training and development has influence on labour productivity in case of public organization .
2. Ho1: Labour productivity has no influence on economic development of public organization
Ho2: Labour productivity has influence on economic development of public organization.

REVIEW OF LITERATURE:

Humphries and Dyer (2001) concluded that organizations provide training or development programs to their employees so that they can align and prepare themselves for present and future organizational needs. Organizations spend an enormous amount of time and money on training in order to assist employee's learning of job-related competencies (Cascio,1991; Noe,2006). Becker(1964) concluded that the organization should continuously provide with new skills for the development of the organization and training the employee should be continuous.

Davidove and Schroeder (1992), Huselid, M.A.(1995) concluded that the revenue cycle is driven by knowledge, innovation, and creativity – all of which come from employees. Employers must actively manage these assets by investing in training. Either training evaluation is carried out in a very casual way, or it does not exist at all in many organizations and the lack of this information makes it impossible either to prove the value of training or to find reasons for its existence.

Rolf & Pareek (2002) outlines some of the consequences of inadequate training as poor planning skills and decision making, which in turn will repay the organization's profit and success. Other symptoms of inadequate training include overtime, high labor turnover, and poor employee morale. Finally by utilizing on the job training and off training methods employees are in the position

to get the necessary skills/knowledge which will make them be more effective and efficient in the organization.

Berman et al. (2001) argues that training effectiveness is constrained because of inadequate transfer of learning from the training environment to workplace environment and they also criticize the current belief that effective training is necessary. The argument is that mere training is not sufficient in improving performance. This line of argument emphasizes that no discussion on the effectiveness of training would be complete without considering the role of human resource utilization. However, most training attempts to improve the organization and process performance by addressing only one level (the job level) and only one dimension of the job level (skills and knowledge). As a result, the training has no significant long-term, training money is wasted, and trainees are frustrated and confused. If inappropriate training method is used then the results will not play any role in the business organization, which will be a waste of resources.

Thomas (1992) stated that though several approaches are used to evaluate training program in the organization but there is no one best way of evaluation, just as there is no best way to train employees. Training results can be best identified mainly on the organizational performance which is triggered by employee performance. This involves the comparison of statistical indicators of performance before and after training took place. The measurement indicators include sales volume and revenue, levels of customer complaints, quality and quantity variables in cost reduction, productivity ratios, cost ratios in terms of stock level and debt collection periods and industrial relations (labor turnover rates; absenteeism, grievances).

The human resources are the most vital resources for any organization. It is responsible for each and every decision were taken, each and every work done and each and every result. Compensation is the remuneration received by an employee in return for his/her contribution to the organization. It is an organized practice that involves balancing the work-employee relation by providing monetary and non-monetary rewards to employees. Compensation management is an integral part of human resources management which helps in motivating the employees and improving organizational effectiveness.

Colville and Millner (2011) noticed that organizations are not recognizing the change caused due to the implementation of performance management and they are trying to implement the change just by seeing other organizations are doing. Even they explained the change in performance management system with the help of past and future changes. The past changes include competencies inclusion, more regular meetings/ feedback, enhancing pay links, simplification, links performance management to strategic business goals. Whereas future change is due to enhancing link with pay,

streamlining of performance with management process, providing more coaching/ development for appraisers, review/ improve rating process, more regular feedbacks.

Sillup et al.(2010) suggested that every organization should consider performance appraisal as the main priority. Treat this performance appraisal as one of the main organizational objectives and integral part of their jobs rather than duty of measuring the performance

Devaraj and Kohli (2003) argued that adaptation of technology also changes the routines, business processes, and work habits. So, HR professionals need to have the competencies of changes management. HR managers need also new competencies on technology and more knowledge on facilities of technology before they had in the past. As a result, applications of technology in the HR functions, affect HR practices and make HR professionals develop their level of performance.

Murnane, Levy and Autor (1999) also studied how the lower-skilled jobs in check processing were redesigned with the introduction of image processing technology. The outcomes for these jobs were more complex, in that instance of both increases and decreases in skill and pay occurred. The transformation required a structured training program and worker buy-in to be successful.

Opkara (2004) and Samad (2007) concluded that if the workforce is satisfied with their job as well as the organizational environment including its colleagues, compensation, and leadership they will be more committed to their organization as compared to when they are not satisfied. The importance of these two areas cannot be overlooked because they are the key factors that influence employee's turnover, employee's performance, and their productivity. The satisfied and committed workforce is usually are contributor and performer towards enhancing organizational productivity. On the basis of above discussion, it is evident that employee compensation has some positive impact on the employee's job satisfaction and organizational commitment. Organizations that have better compensation management system put a very positive impact on their employees.

PRESENT STUDY :

The study is to analyze the existing practices relating to labour productivity and economic development of the employees , a reputed public organization with business interests in Steel . The present survey was conducted in a Public sector Organization. It covers mostly the executives , workers and staff. The study covers various aspects like Building human capacities, Rewards and Compensation , Employee Involvement and Commitment and Performance Management. The methodology of selecting the sample respondents can be explained in three stages.

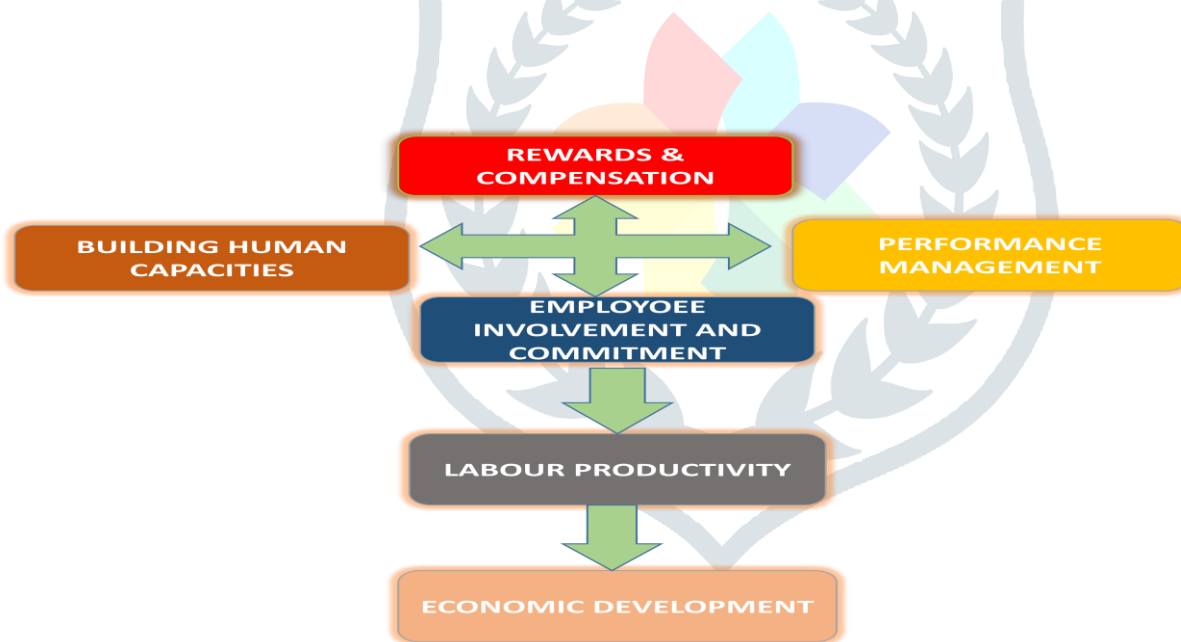
Out of the total population of 18,153 regular employees' of the selected organization, only 410 employees are selected as per Jeff Watson formulae (2001). In the next stage, respondents are selected conveniently (whoever is available and can spare time to fill up the questionnaire).

Table.No.1

Distribution of sample respondents, according to Department and Area of Technology

SL.NO	Type Of Department	Total
1	Works	365
2	Non-Works	45
	Total	410

The focus of the study is on the perceptions of sample respondents selected from works and non-works departments.



Building Human Capacities

Public Organizations in general, strike hard for building human capacities by providing training facilities for improving the skills of employees. Training programs are meant for not only to develop the individual skills but also the organizational abilities. Therefore, building human capacities is said to be an important human resource practice for any organization.

Data collected on nine identified items relating to training and development activities and the respondent's opinions are calculated and presented in table no.2

Table No.2
Building Human Capacities and percentage distribution
of respondents' Opinions

S.No	Items	HD	D	CS	S	HS	Mean	SD	PS
1.	The training and development facilities provided.	1.7	4.6	5.9	60.2	27.6	4.07	0.82	76.83
2.	Content of the programmes	1.7	4.4	9.8	66.8	17.3	3.94	0.77	73.41
3.	The trainers provided	2.2	3.4	13.9	59.3	21.2	3.94	0.83	73.48
4.	Quality of the training and development programmes.	1.0	2.9	13.4	61.7	21	3.99	0.74	74.70
5.	Relevance of the programmes to job requirement.	1.7	7.6	12.4	54.6	23.7	3.91	0.90	72.74
6.	Learning environment in the organization.	1.2	7.3	9.8	63.2	18.5	3.90	0.82	72.62
7.	Regularity of the programme	2.2	8.0	11.2	54.9	23.7	3.90	0.93	72.44
8.	Programmes for furthering our career.	1.7	8.3	11.5	61.7	16.8	3.84	0.86	70.91
9.	Improvement in skills after the programmes.	1.2	8.8	13.9	57.3	18.8	3.84	0.87	70.91

Source: Primary data

It can be understood from the above table.2, that the minimum percentage score is 70.99% and the maximum is 76.83% indicating that, overall a minimum of 71% of respondents are satisfied with the training programs arranged in the organization. About 76.83% of the respondents expressed satisfaction with the training and development facilities provided while it is only 71% expressed satisfaction on the positive impact of training programs. However, in general, the mean value, standard deviation and the highest percentage score value indicates that the employee satisfaction on the training facilities and program are very much satisfactory and help them to build their skills.

2. Performance Management System

The Performance Management Mechanism is said to be the backbone of an organization. It is a process by which the performance of employees is measured and effective future plans can be prepared by the management. A good performance management system, acceptable for both employees and employers can create wonders and lay good foundation leading to sustainability of the organization.

Table No.3.

Building Human Capacities and percentage distribution of respondents' Opinions

Percentage distribution of Respondents' Opinions on Items of Performance Management System

S.No	Items	HD	D	CS	S	HS	Mean	SD	PS
1.	The statements in the appraisal.	2.7	3.4	12.4	63.4	18.0	3.91	0.82	72.68
2.	The targets set for your performance.	1.0	3.9	12.7	61.2	21.2	3.98	0.76	74.45
3.	The method of rating of your performance.	2.0	5.4	21.5	47.8	23.4	3.85	0.91	71.34
4.	The performance rating shared with you.	2.0	7.8	22.4	48.8	19.0	3.75	0.92	68.78
5.	The performance rating results and its uses.	1.5	6.8	24.9	47.8	19.0	3.76	0.89	69.02
6.	The training provided based on performance appraisal.	1.5	8.0	21.7	52.9	15.9	3.74	0.87	68.41
7.	The reporting and reviewing system in the performance appraisal.	1.5	5.1	23.4	54.6	15.4	3.77	0.82	69.33
8.	Timing of the appraisal system.	2.0	3.9	18.8	58.3	17.1	3.85	0.82	71.16

Source: Primary data

It can be seen from the table that the employees are better aware of the targets set for good performance as 74.45% of respondents expressed satisfaction towards the target set by the organization. They opined that they are pretty well aware of the statements on appraisal (72.68%), targets (74.5%), performance method rating(71.34%), performance rating sharing (68.78%) results and its uses (69.02%), and training based on results of performance appraisal (68.41%) and reporting and reviewing (69.33%).

3.Employee Involvement and Commitment

Employee Engagement is a critical component without which the organization can't claim success. Employee's of any organization particularly established units should always feel proud to be associated with the organization. They should always speak positively about the career prospects, growth participation in decision making etc. Data relating to these aspects are analyzed.

Table No.4

**Building Human Capacities and percentage distribution
of respondents' Opinions**

**Percentage of Respondents' Opinions on Items of
Employee Involvement and Commitment**

S.No	Items	HD	D	CS	S	HS	Mean	SD	PS
1.	Your pride in being an employee of this organization.	2.4	1.0	3.2	49.3	44.1	4.32	0.80	82.93
2.	Utilization of opportunities provided by the organization to improve your career.	2.2	5.1	10.2	48.3	34.1	4.07	0.92	76.77
3.	Comparing with other similar organization career opportunities provided by this organization.	2.9	4.6	12.2	54.1	26.1	3.96	0.91	73.96
4.	My involvement in the job allotted to me.	2.2	2.7	8.8	60.7	25.6	4.05	0.80	76.22

Source: Primary data

All the four elements incorporated in the HR dimension of employee involvement and commitment has recorded a minimum of 73.96% positive response by the respondents. The Percentage Score with respect to the statement “Your pride in being an employee of this organization” has the highest acceptance with 82.93%.

4. Rewards and Compensation

Organizations whether Public or Private Sector resort to paying Rewards either in suitable Monetary or Non Monetary form as these two motivate the employee's to work more efficiently and help the organization.

Salary according to qualification's, experience, skill and other tangible and intangible benefits are listed for an intensive analysis of the Rewards and Compensation Practice.

Table No.5.

Rewards and Compensation Practices and percentage distribution of Respondents' Opinions

S.No	Items	HD	D	CS	S	HS	Mean	SD	PS
1.	Salary in terms of qualification .	2.7	10	6.6	55.6	25.1	3.90	0.98	72.62
2.	Salary in terms of experience.	3.2	12.4	7.6	58	18.8	3.77	1.00	69.21
3.	Salary in term of responsibilities.	3.2	12.9	10.5	53.7	19.8	3.74	1.02	68.48
4.	Salary and its linkage to workload.	3.7	14.4	15.4	50.7	15.9	3.61	1.03	65.18
5.	Incentives for efficiency and workload.	6.8	14.6	16.1	49.3	13.2	3.47	1.10	61.83
6.	Methods of wage fixation.	4.6	14.4	21.7	47.1	12.2	3.48	1.03	61.95
7.	Bonus calculation practice.	7.6	12.7	21.0	48.0	10.7	3.42	1.08	60.43
8.	Appreciation provided for good work.	7.8	16.6	16.6	49.3	9.8	3.37	1.11	59.15

Source: Primary data

According to the data analyzed in table no.5, the percentage score is the minimum for the practice of appreciating good work in the plant (59.15%), While it is as high as 73% for salary according to qualifications. The weighted means also range between 3.37 and 3.90, a maximum number of employee's have expressed satisfaction towards the salary and other monetary benefits and expressed unhappiness for not appreciating good work. The means for a method of wage fixation and bonus calculation is 3.48 and 3.42 respectively.

FINDING OF THE STUDY:

- It is identified that there is good Involvement and Commitment among the employee's towards their organization. Employee's have an average opinion on the utilization of opportunities provided by the organization to improve their career and regarding involvement in the job allotted to them. When compared to the career opportunities provided by the organizations, the employees are slightly dissatisfied as they felt that the career opportunities provided by other organizations are better.
- Ho2: Training and development has influence on labour productivity.

Training and development has influence on labour productivity because the analyses has pointed out that about 76.83% of the respondents expressed satisfaction with the training and

development facilities provided while it is only 71% expressed satisfaction on the positive impact of training programs. However, in general, the mean value, standard deviation and the highest percentage score value indicates that the employee satisfaction on the training facilities and program are very much satisfactory and help them to build their skills.

➤ It is concluded that majority of respondents are satisfied in setting targets for performance and the statements in the appraisal are systematic. When it comes to the method of rating and timing of the appraisal system, the employee's are of average opinion. The majority of respondent are of the opinion that performance rating results and its uses, performance ratings shared with them and training provided based on Performance Appraisal were the elements which dissatisfies them in the organization.

➤ Ho2: Labour productivity has no influence on economic development of organization.

Employee Engagement is a critical component without which the organization can't claim success. Employee's of any organization particularly established units should always feel proud to be associated with the organization. They should always speak positively about the career prospects, growth participation in decision making etc. All the four elements incorporated in the HR dimension of employee involvement and commitment has recorded a minimum of 73.96% positive response by the respondents.

SUGGESTIONS:

➤ Performance Management System should be improved by evaluating with the open door discussions about the employee's advancement and training needs. This will help the employee work towards increasing his skill and knowledge. Then ensure that the employee performance evaluations are directly linked to the compensations.

➤ Frequent training programs on oral communications, business awareness programs, responsibility and initiative, team building, problems solving and IT competency should be conducted for developing the non-technical skills of the employees.

➤ Reward system in the plant should modify by introducing effective corporate recognition awards and even some bonus programs like new idea bonus program where the company offers a fixed percentage for developing a process or strategic improvement that is expected to improve profits in the future. Quality Circles may be extended by awarding a certain percentage of saving to the organization to the team or the individual.

CONCLUSION :

The study reveals that labour productivity plays an important role in any public organization as employees are only responsible from start to end process of any business activity, the more the labour productivity is more the productivity of the organization and vice-verse. It is the evident that the labour productivity depends on the quality of building human capacities, level of commitment and involvement possessed by the employees. From the analysis it is the evident that the training programs in the public organization was made attractive with foreign trips for training at the place of the supplier of machinery. The willing employees were sent for overseas training on new machinery being installed.

REFERENCES

1. Patrick, M. Wright, (2010), "Theoretical perspectives for strategic human resource management". *Journal of Management*, 230-235.
2. Coda, R., Cesar, A. M. R. V. C., Bido, D. S., and Louffat, E. (2009), "Strategic HR? A Study of the Perceived Role of HRM Departments in Brazil and Peru", *Brazilian Administrative Review*, 6(1):15-33.
3. Buhler, P. (2002), *Human Resource Management*, Avon, Massachusetts.
4. Humphrils, M.T., and Dyer, S.(2001), "Changing The Nature And Conditions Of Employment: Stimulating Critical Reflection", *Journal Of Management Education*, 25:325-340.
5. Cascio, W. F.(1991), *Applied Psychology in Personal Management* (4th edition), Englewood Cliffs, Prentice Hall, New Jersey,301-317.
6. Noe, R.A., Hollenbeck, J.R., Gerhart, B. and Wright, P.M. (2006), *Human Resource Management: Gaining a Competitive Advantage*, (6th edition), Mc Graw Hill Irwin, Boston, M A.
7. Becker, G.(1964), *Human Capital*, Chicago University, Chicago, IL.
8. Davidove, E.A., and Schroeder, P.A. (1992), "Demonstrating ROI of Training", *Training and Development*, 46(8):70-71.
9. Huselid, M.A. (1995), "The impact of Human Resource Management Practices on Turnover, Productivity and Corporate Financial Performance", *Academy of Management Journal*, 38(3): 635-672.

10. Rolf, P. L., and Udai, P. (2002), Training for Organisational Transformation (part 2), Sage Publications Ltd. New Delhi.
11. Berman, E.M., Bowman, J., West, J. and Van Wart, M. (2001), Human Resource Management In Public Service: Paradoxes, Processes And Problems, Sage Publications. Inc., London.
12. Thomas, B. (1992), Total Quality Training: The Quality Culture and Quality Trainer, McGraw-Hill International (UK) Ltd., London.
13. Naukrihub (2009), Payroll System and Compensation Management. Retrieved from www.payrol.naukrihub.com/compensation.html. Accessed on 20/6/2015.
14. Colville, K., and Millner (2011), “Embedding Performance Management: Understanding. The Enablers For Change”, Strategic HR Review, 10(1):638-710.
15. Sillup, G.P., and Klimberg R.(2010), “Assessing The Ethics Of Implementing Performance Appraisal System”, Journal Of Management Development, 29(1):160.
16. Devaraj, S., and Kohli, R.(2003), “Performance Impacts of Information Technology: Is Actual Usage the Missing Link?”, Management Science, 49(3): 273–289.
17. Cooke, F L. (2000), Human Resource Strategy to improve Organizational Performance: A route for British firms, Working Paper No 9, Manchester School of Management.
18. Murnane, Richard J., Frank Levy, and David Autor (1999), Technological Change, Computers, and Skill Demands: Evidence from the Back Office Operations of a Large Bank, Paper presented at the NBER Labor Workshop.