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Message from Assistant Editor In Chief

Let me first of all take this opportunity to wish all our readers a very happy, peaceful and prosperous year ahead.

This is the first issue of the first Volume of International Journal of Engineering Research and General Science. A total of 6 research articles are published and I sincerely hope that each one of these provides some significant stimulation to a reasonable segment of our community of readers.

In this issue, we have focused mainly on the welfare and management of our environment along with the recent research that can have a great impact in our society through conceptual ideas implementation approach. As such, we encourage submission of more recent and relevant ideas and research papers from our readers too, which will be published in the upcoming issues.

I would like to take this opportunity to thank each and every writer for their contribution and would like to thank entire International Journal of Engineering Research and General Science (IJERGS) technical team and editor member for their hard work for the development of research in the world through IJERGS.

Last, but not the least my special thanks and gratitude needs to go to all our fellow friends and supporters. Your help is greatly appreciated and the fruit of your assiduous work would be reflected soon. I hope our reader will find our papers educational and entertaining as well. Our team have done good job however, this issue may possibly have some drawbacks, and therefore, constructive suggestions for further improvement shall be warmly welcomed.

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Study of optimizing Techniques of Reservoir Operation

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Abstract— Water being a prime natural resource, its essentiality and need is getting increased constantly. The management of water is crucial keeping in view the assessment and the availability and utilization. It needs proper planning and efficient management of water is foremost for development of a country. For efficient use of water resources, reservoirs are to be planned and operated under proper management of water resources system. For using this water efficiently for different purposes like water supply demand, municipal and irrigation water supply, hydroelectric power generation etc… there is need optimizing techniques of reservoir operation. Some of the optimizing techniques are Stochastic dynamic programming (SDP) model, System dynamic (SD) model, Intelligent decision support system (IDSS) approachetc.,

Keywords— Reservoir, Optimizing techniques, Stochastic Dynamic Programming, System Dynamic Model, Intelligent Decision Support System.

INTRODUCTION

In India, reservoirs are usually constructed to serve multiple purposes, such as irrigation, municipaland industrial water supply, hydropower generation and flood control. Because of the high temporal and geographical variability of rainfall in this country, reservoir operation occupies an important place in the utilization of water resources. Water being a prime natural resource, its essentiality and need is getting increased constantly. The management of water is crucial keeping in view the assessment and the availability and utilization. It needs proper planning and efficient management of water is foremost for development of a country. For efficient use of water resources, reservoirs are to be planned and operated under proper management of water resources system. After a dam has got constructed, detailed guide line in the form of Reservoir Operating Policy will have to be given to the operator for enabling him to take decision about storing or releasing of water.

Reservoir operation is one of the challenging problems for water resources planners and managers. To obtain optimal operating rules, a large number of optimization and simulation models have been developed and applied over the past several decades.

PURPOSE OF RESERVOIR

Direct water supply

Many dammed river reservoirs and most bank-side reservoirs are used to provide the raw water feed to a water treatment plant which delivers drinking water through water mains. The reservoir does not simply hold water until it is needed; it can also be the first part of the water treatment process. The time the water is held for before it is released is known as the retention time.

Hydroelectricity

A reservoir generating hydroelectricity includes turbines connected to the retained water body by large-diameter pipes. These generating sets may be at the base of the dam or some distance away. Some reservoirs generating hydroelectricity use pumped re-charge in which a high-level reservoir is filled with water using high-performance electric pumps at times when electricity demand is low and then uses this stored water to generate electricity by releasing the stored water into a low-level reservoir when electricity demand is high. Such systems are called pump-storage schemes.

Controlling watercourses

Reservoirs can be used in a number of ways to control how water flows through downstream waterways.

1 Downstream water supply: water may be released from an upland reservoir so that it can be abstracted for drinking water lower down the system, sometimes hundreds of miles further down downstream

2. Irrigation: water in an irrigation reservoir may be released into networks of canals for use in farmlands or secondary water systems. Irrigation may also be supported by reservoirs which maintain river flows allowing water to be abstracted for irrigation lower down the river.[18]

3. Flood control: It is also known as an "attenuation" or "balancing" reservoir, flood control reservoirs collect water at times of very high rainfall, then release it slowly over the course of the following weeks or months. Some of these reservoirs are constructed across the river line with the onward flow controlled by an orifice plate. When river flow exceeds the capacity of the orifice plate water builds behind the dam but as soon as the flow rate reduces the water behind the dam slowly releases until the reservoir is empty again. In some cases such reservoirs only function a few times in a decade and the land behind the reservoir may be developed as community or recreational land. A new generation of balancing dams are being developed to combat the climatic consequences of climate change. They are called "Flood Detention Reservoirs". Because these reservoirs will remain dry for long periods, there may be a risk of the clay core drying out reducing its structural stability. Recent developments include the use of composite core fill made from recycled materials as an alternative to clay.

4. Canals: Where a natural watercourse's water is not available to be diverted into a canal, a reservoir may be built to guarantee the water level in the canal; for example, where a canal climbs to cross a range of hills through locks.

5. Recreation: On salmonid rivers special releases are made to encourage natural migration behavior's in fish and to provide a variety of fishing conditions for anglers.

1.1. Flow balancing

Reservoirs can be used to balance the flow in highly managed systems, taking in water during high flows and releasing it again during low flows. In order for this to work without pumping requires careful control of water levels using adjustable sluices.

1.2. Recreation

The water bodies provided by many reservoirs often allow some recreational uses such as fishing, boating, and other activities. Special rules may apply for the safety of the public and to protect the quality of the water and the ecology of the surrounding area. Many reservoirs now support and encourage less informal and less structured recreation such as natural history, watching, landscape, walking and hiking and often provide information boards and interpretation material to encourage responsible use.

ENVIRONMENTAL IMPACTS OF RESERVOIR

RESERVOIR SEDIMENTATION

Rivers carry sediment down their riverbeds, allowing for the formation of depositional features such as river deltas, alluvial fans, braided rivers, oxbow lakes, levees and coastal shores. The construction of a dam blocks the flow of sediment downstream, leading to downstream erosion of these Sedimentary depositional environments, and increased sediment build-up in the reservoir. While the rate of sedimentation varies for each dam and each river, eventually all reservoirs develop a reduced water-storage capacity due to the exchange of storage space for sediment. Diminished storage capacity results in decreased ability to produce hydroelectric power, reduced availability of water for irrigation, and if left unaddressed, may ultimately result in the expiration of the dam and river.

COASTAL EROSION

As all dams result in reduced sediment load downstream, a dammed river is said to be "hungry" for sediment. Because the rate of deposition of sediment is greatly reduced since there is less to deposit but the rate of erosion remains nearly constant, the water flow eats away at the river shores and riverbed, threatening shoreline ecosystems, deepening the riverbed, and narrowing the river over time. This leads to a compromised water table, reduced water levels, homogenization of the river flow and thus reduced ecosystem variability, reduced support for wildlife, and reduced amount of sediment reaching coastal plains and deltas. This prompts coastal erosion, as beaches are unable to replenish what waves erode without the sediment deposition of supporting river systems. Channel erosion of rivers has its own set of consequences. The eroded channel could create a lower water table level in the affected area, impacting bottomland crops such as alfalfa or corn, and resulting in a smaller supply.

EFFECTS ON HUMAN

While reservoirs are helpful to humans, they can also be harmful as well. One negative effect is that the reservoirs can become breeding grounds for disease vectors. This holds true especially in tropical areas where mosquitoes and snails can take advantage of this slow flowing water.

OPERATION

Water falling as rain upstream of the reservoir together with any groundwater emerging as springs is stored in the reservoir. Any excess water can be spilled via a specifically designed spillway. Stored water may be piped by gravity for use as drinking water, to generate hydro-electricity or to maintain river flows to support downstream uses. Occasionally reservoirs can be managed to retain high rain-fall events to prevent or reduce downstream flooding. Some reservoirs support several uses and the operating rules may be complex. Most modern reservoirs have a specially designed draw-off tower that can discharge water from the reservoir at different levels both to access water as the reservoir draws down but also to allow water of a specific quality to be discharged into the downstream river as compensation water.

The operators of many upland or in-river reservoirs have obligations to release water into the downstream river to maintain river quality, support fisheries and maintain downstream industrial and recreational uses or for a range of other requirements. Such releases are known as compensation water.

METHODOLOGY

OPTIMISING TECHNIQUES OF RESERVOIR OPERATION

Optimising techniques of reservoir operation are used for different operations like water supply, flood control, hydropower generation, irrigation supply etc..,

SDP (STOCHASTIC DYNAMIC PROGRAMMING):

The SDP involves two steps as follows:

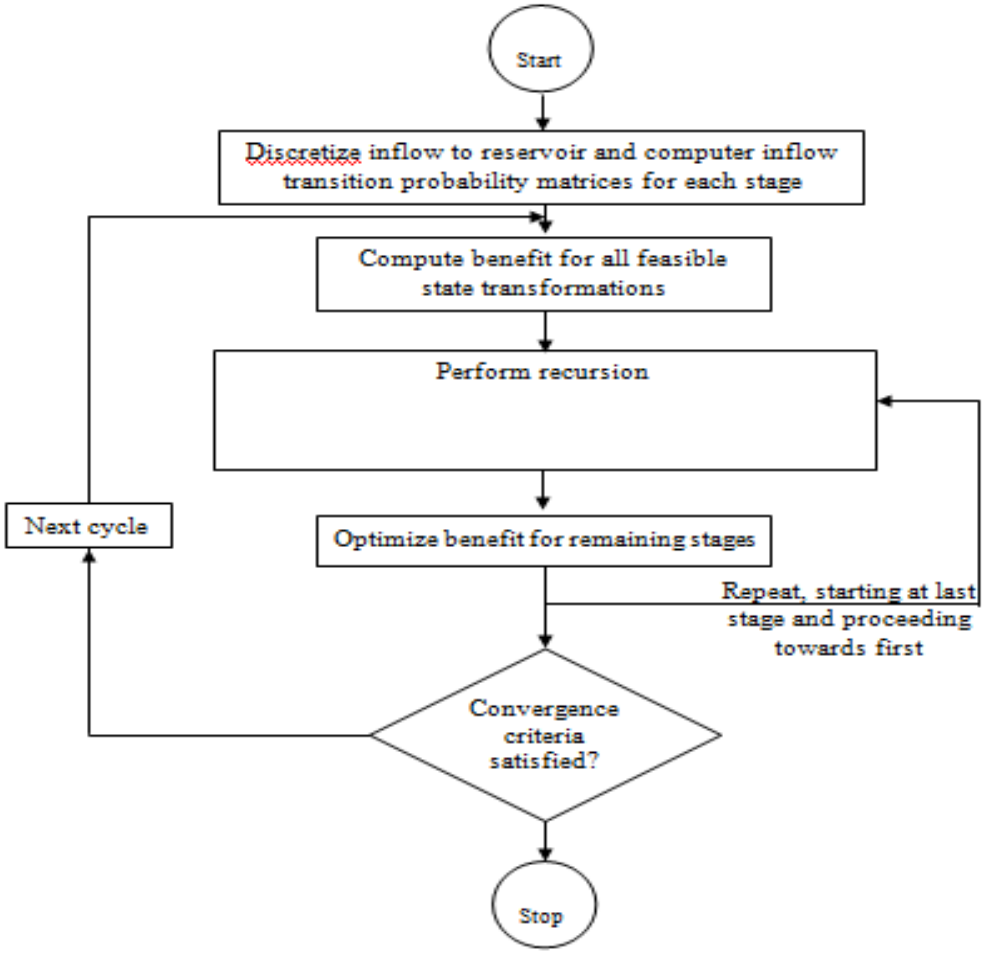
1. Discretized the Inflow and Reservoir Storage: The inflow during the same time period are discretized into N intervals from minimum to maximum. The probability of inflow interval i (during time period t) to inflow j (during time period t + 1) is also computed from the observed inflow series.
2. Finding the optimal solutions: By using Equation

$F(S_i,I_i,I_{i+1}.....I_{i+n}) = \max B_i(S_i,R_i)+E_{i+1}(f(S_{i+1},I_{i+1},I_{i+2}.....I_{i+n}))$

The optimal solution is found and saved as optimal operating rules. The following operating rules are used in this paper. .

$V_{t+1} = D(V_t,I_t)$

Where$t_1$is the reservoir storage need to decide, and V_t and I_t are the current reservoir storage and inflow.[3]



Flowchart describing SDPModel

SYSTEM DYNAMIC (SD) APPROACH:

This study deals with modeling reservoir operation using the SD approach. The model is developed for a single multipurpose reservoir with a focus on flood management role of the reservoir. Then, the model is used to develop a reservoir operational policy for high-flow years to minimize flooding. The model also serves as a tool for studying impacts of changing reservoir storage allocation and temporal distribution of reservoir levels and outflows. The general architecture of the model is presented in this section, and model sectors and the complex dynamic relationships among these sectors are also discussed.

The SD model of a reservoir can be constructed graphically on the screen by employing basic building blocks, i.e., stocks,flows, connectors, and converters available in the model development tool. In the reservoir model the storage is represented as a stock. Varying inflows and outflows cause changes in storage volume over time. Inflows and outflows are represented by building block ‘‘flow.’’ Converters are provided to extend the range of calculations that can be performed on flows, and they house data and logical/mathematical functions to operate the system. Reservoir operating rules are also implemented through converters. Connectors (directed arrows) link various elements of the model, i.e., converters, flows, and stock, to indicate relationships and influence. The simulation model uses differential and difference equations to describe the complex dynamic systems.[5]

A general reservoir simulation model for flood management purpose can be divided into three main sectors: the reservoir,the upstream area, and the downstream area.

Reservoir

This is the core sector of the reservoir model. Inflows and outflows from the reservoir are the main components of this sector. Flow from all tributaries directly contributing to the reservoir is considered as inflow to the system. Inflow datafiles, one for each flood year, are provided to the model as input. Total reservoir outflow consists of reservoir releases,spill, evaporation, and seepage losses. Reservoir storage can be described in terms of mass balance equation:

Storage(t) = Storage(t - 1) + (Qin -Qout) . dt(1)

Storage at time step t is equal to the storage at a previous time step plus the difference of inflow and outflow. The solutioninterval (dt) is selected to ensure stability within the computation process.

Upstream Flooding

This sector calculates the area flooded upstream of the reservoir. Upstream flooding is triggered by a combination ofreservoir inflow, reservoir level, and reservoir outflow. The number of days when the upstream area is flooded is alsocounted in this sector.

Downstream Flooding

This sector calculates individual and total flooded area and duration of flooding due to the reservoir operation at selectedlocations between the dam and the final disposal point of the river. All sources and sinks affecting the flow in the river areintroduced in this sector. To set up a general reservoir simulation model for flood management purpose inflows, system constraints and operating rules are required. Additional data might be required depending on specific objectives of the study.

As output, the model provides information on variation of the reservoir levels, area flooded upstream and downstream of the reservoir, and duration of flooding. Once all sectors are developed and model relationships and operating rules are defined, the user can simply run the simulation and evaluate the impacts of alternate operating rules.

CHANCE-CONSTRAINED GOAL PROGRAMMING (CCGP) MODEL:

Chance-constrained goal programming (CCGP) may be considered as the extension of goal programming (GP) and chance constrained programming (CCP), two popular methodologies in reservoir operation studies. Each of these methodologies has an attractive feature in such a way that CCP allows the direct consideration of random variables in the model and GP allows the direct consideration of multiple goals which may be conflicting and non commensurate. In GP, the underlying philosophy is based on "satisfying" rather than "optimizing." Instead of attempting to minimize or maximize various objective functions, GP is concerned with the conditions of achieving pre-specified targets or goals. CCGP combines the advantages in both methods so that it is capable of solving systems with multiple objectives and stochastic inflows.[9]

APPLICATION

The CCGP model is applied to a three-reservoir system which is a portion of the Red River reservoir system in Oklahoma. These reservoirs are: Denison, Broken Bow and Pine Creek. Denison reservoir is operated for the purposes of flood control, water supply and hydroelectric power, regulating flows of Red River, improving navigation, and recreation. The purposes of Broken Bow reservoir are flood control, recreation, hydroelectric power, water supply, fish and wildlife protection, and water quality control. For Pine Creek reservoir, its purposes are flood control, water supply, water quality control, fish and wildlife protection, and recreation. The system is operated by the U.S. Army Corps of Engineers. The data required in the CCGP model may be classified into three categories: physical data, hydrological data, and demand date. Physical data are data which relate to the constraints of the model, e.g. reservoir and power plant capacities, maximum and minimum flows, storage-elevation-area relationship, and flood control storages. Hydrological data include natural inflows into and evaporations from the reservoirs. These data are provided in the U.S. Army Corps of Engineers (1970). Demand data involve various demands to be satisfied by the reservoirs such as demand for M&I water supply, contracted amount of hydroelectric power generation, and desired storage levels for recreational purpose. The data which involve hydroelectric power generation are supplied by Southeastern Power Administration in Tulsa, Okla.

The goals are ranked, with the more important one first, as: water supply for M&I, water supply downstream, hydroelectric power generation, recreation, and flood control.

The proposed CCGP methodology allows the reservoir manager to rank various goals according to their relative importance. The target levels for the goals are usually available in most systems. Trade-offs among conflicting goals can be evaluated so that a non dominated and satisfactory solution can be obtained. The use of conditional CDF's which consider the correlation between inflows can improve the accuracy of the results. A possible extension to this study is to use nonlinear goal programming to approximate the

nonlinear functions (due to the hydropower generation) in the formulation. Another extension would be to use a combine approach of dynamic programming (DP) and goal programming (GP) to solve the problem. That is, each individual period may be solved by GP, and the most appropriate release decision and storage level for each period are identified by DP so that the problem is optimized over the whole planning horizon. The objective function of the GP in each period is to minimize the undesirable deviations from target values during that period. A possible objective function of the DP formulation would be to maximize the amount of hydropower generated during the whole planning horizon. Thus, nonlinearity due to the hydropower function can be handled by DP. However, the GP formulation in each period may have to be solved a number of times according to the possible levels of hydropower generation during that period.[9]

BAYESIAN STOCHASTIC DYNAMIC PROGRAMMING (BSDP):

BSDP is the proposed model using stochastic dynamic programming (SDP) and Bayesian decision
Theory (BDT)

Stochastic dynamic programming (SDP)

SDP model which employs the best forecast of the current period's inflow to define a reservoir release policy and to calculate the expected benefits from future operations. The best forecast includes information about the entire flow data like inflow, outflow, storage capacity but whether this technique
Provides better operating policies in real-time operation has not been proven**.**

Bayesian decision Theory (BDT)

The use of Bayesian decision theory (BDT) in reservoir operation because of its flexibility in being able to incorporate new information in the interpretation of probabilities. It is nothing but the revision of
State transition probabilities in classical SDP in order to capture the uncertainty of the forecast. It develops a forecasting system in which probabilistic data are continuously updated on the basis of current information. 1970].Bayesian decision procedures not only optimally account for forecast uncertainty, but in Contrastto other decision procedures,they ensurea nonnegative economic gain from a real-time forecast matterhow large the forecast uncertainty is.

Bayesian stochastic dynamic programming (BSDP)

The proposed model, called Bayesians stochastic dynamic programming(BDT and SDP), which includes in flow, storage and forecast state variables, describes stream flows with a discrete lag 1 Markov process and uses BDT to incorporate new information by Updating the prior probabilities to posterior probabilities is, used to generate optimal reservoir operating rules. T his continuous updating can significantly reduce the effects of natural and forecast uncertainties in the model. In order to test the value of the BSDP model for generating optimal operating rules, real-time reservoir operation simulation models are constructed using 95 years of Monthly historical inflow. Two versions of BSDP models are generated. Each generates optimal operating policies capturing the natural and forecast discrimination of system. [12]
Reservoir operators and planners need to have a strategy for how much water to release overa planning period for the best use of the stored water.
BSDP is used here to find an optimal set of policies.
In BSDP, the decision variables (release) depend on thestate of the system, which is defined by three variables inthis study.

1. The characteristic storage at the beginning of time period
2. The characteristic inflow into the reservoir
3. The characteristic forecast for the next time period

IMPLICIT STOCHASTIC MODEL

The implicit stochastic model is aimed at solving the specific problem of the optimal reservoir yield
When the demand is not known. The model is created to assist in the long-term comprehensive water
Management planning.
The approach used for optimizing the multipurpose reservoir yield belongs to the group of implicit stochastic techniques. In order to solve the problem of reservoir yield estimation, a three-level algorithm is proposed which uses the results of an external autoregressive moving average (ARMA) model for generating inflow sequences as the input data (Figure 2). At the first level, the simulation approach is used for computing the objective function. The reservoir rules are computed at the second level. Finally, the third level is used for estimating the single multipurpose reservoir yield based on the predefined relative level of supply.[16]

Simulation Model, First Level

The simulation model is based on the continuity equation. Here we calculate storage, release and water demand.

Simulation model, second level

In this we compare whether loss will occur or not. If release is more than demand loss will not occur. If release is less than demand loss will occur. If loss was happened then the process will repeated by assuming the suitable optimal values and loss is calculated by recursion

Simulation model, third level

In this level we calculate the yield by assuming the maximum storage and all reservoir purposes

CONCLUSION:

This paper gives brief description of different optimizing techniques of reservoir operation. These operations are used to operate reservoir in a proper way to utilize water in an efficient manner for the purposes like power generation, irrigation purposes, drinking water supply, flood control etc.,.

In this paper Stochastic Dynamic Programming model is used for Hydroelectric power generation, System Dynamic Approach model gives optimizing technique of flood control, Chance Constrained Goal Programming model gives optimizing techniques of multipurpose reservoir (flood protection, municipal and industrial (M&I) water supply, hydroelectric power generation, recreation etc.), Bayesian stochastic dynamic programming (BSDP) gives optimizing techniques of inflow and storage and finally Implicit Stochastic Model for reservoir yield operation.

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An Embedded Real-Time Finger-Vein Recognition System for Security Levels

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Abstract— In this project, we propose a real-time embedded finger-vein recognition system (FVRS) for authentication on mobile devices. The system is implemented on an embedded platform and equipped with a novel finger-vein recognition algorithm. The proposed system consists of four hardware modules: radio frequency identification system, image acquisition module, embedded main board, and human machine communication module. RFID module will start the very initial communication between the user and the device The image acquisition module is used to collect finger-vein images. The Embedded main board including the Microcontroller chip, memory (flash), and communication port is used to execute the finger-vein recognition algorithm and communicate with the peripheral device. The human machine communication module (LED or keyboard) is used to display recognition results and receive inputs from users.

Keywords— Finger vein recognition system, RFID module, Embedded platform, communication module, image acquisition module

INTRODUCTION

Today, security is very much essential in all kind of activities. Illegal activities are happening in every place today. So government and corporate sections are concentrating mainly on the security levels with their every invention. This will bring privacy all over the world. So in a thought of bringing privacy through security level[2], this project has been developed. This FVR system mainly uses three divisions which are image acquisition module, embedded main board, and human machine communication module. Each unit is having its own major role over the project. In this paper , two major areas have been focused. Those are authentication[5] and identification. FVR system performs the authentication function with the finger. vein recognition. Every time when the user is going to use the system, the finger vein of will be scanned and comparison will be done.

Finger vein recognition is very effective when compared with pattern recognition, pin number security the other type of Biometric[1] security methods like finger print security, palm print security, image scanning and some recognition techniques. FVR system uses the vein scanning. As it is related to the biological factor, it is very difficult to change the vein information of a user. So, this system can provide more security[3] than any other security level. In this FVR system, we are focusing on high security[4] with RFID technology. Initially each and every user will be given with one RFID secret card. This will make an effective initial communication between the user and the device. This technique will make the device to extract the user information from its memory.

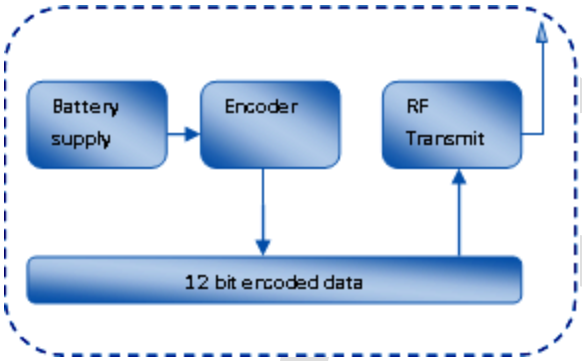


Figure 1 will illustrates this feature.

Figure 1: ***FVRS – Active secret card section***

In FVR system, the RFID module is used to collect the user date base. With this system, an unique code will be generated for each and every user for storing the finger vein[9] details in the server. Here an active RFID technology is used for creating the secret signal. The encoded signal will be continuously transmitted by the card if it is in on state. This RFID will reduce the complexity of the image acquisition module. As the RFID have an unique signal it can store only one vein information. So authentication and identification will become soon. Because of these features the FVRS will be a faster recognition system.

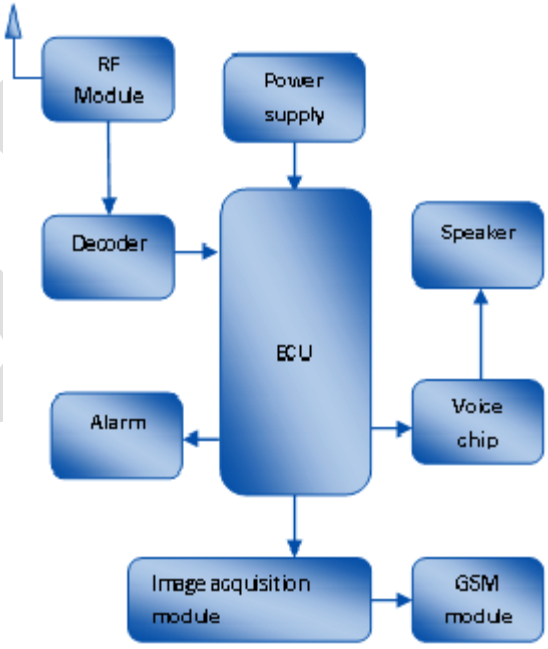


Figure 2: ***FVRS – ATM Recognition unit***

In this section, RF receiver module is attached with the embedded control unit. This unit receives the secret digital data from the card and it will be given to the controller. In the FVRS recognition unit , vein images will be stored in the image acquisition module. If RF receiver receives any digital code, then automatically code verification will be done inside the embedded control unit. If the code is matched then an asynchronous command will be given to the image acquisition[10] module. Then the vein image comparison will be done inside the processor. If the image is matched then automatically the device will go to its working state.

To this ECU further we have interfaced a GSM module. With this module we can develop the password system. When any access has been there means automatically an intimation will be given to the controlling authority. The unit will send a password with this intimation. It will make a very effective security to the user. This password will be working for one time. It will play an effective authentication process. This mobile GSM communication module will not only send the intimation for authorise but also for unauthorised.

DESIGN AND IMPLEMENTATION

This project is implemented in an effective way to improve the security. Initially an active RF method is used to provide a basic security and to initialize the communication between the FVRS mobile device and the user. For a user single card will be provided. This card contains a digital data which will acts as a key to the image recognition unit. The FVRS – mobile recognition unit first checks the address bits from the transmitter section. If address is matched then the corresponding data signal will be passed to the controller unit. Through this method identification of the user will be implemented effectively. Now the controller unit will send a signal to the image acquisition unit to open the data base vein detail.

Image acquisition unit will process the user's vein image with the database image. This will work through different image processing techniques. For an easy identification alert system is also embedded in this unit. If any mismatch is found then automatically the ECU will alert the entire system continuously. At the same time intimation will be given to the users security number. This intimation is common for authentication. If anything happens in the FVRS - Mobile recognition unit, then the corresponding result will be transferred to the security number without any delay. If the vein image is matched in the image acquisition module then, a secret password will be send to the security number of the user. The user should enter the particular password for further accessing. This will bring more security to the user.

OVERVIEW OF THE FVRS UNIT

The FVRS – Mobile unit has the following important module section. Those are radio frequency identification system, image acquisition module, embedded main board, and human machine communication module. These sections which will play the important role.

In the existing method, there is a long list of available biometric patterns[8], and many such systems have been developed and implemented, including those for the face, iris, fingerprint, palmprint, hand shape, voice, signature, and gait. Notwithstanding this great and increasing variety of biometrics patterns, no biometric has yet been developed that is perfectly reliable or secure. For example, fingerprints and palm prints are usually frayed; voice, signatures, hand shapes and iris images are easily forged; face recognition can be made difficult by occlusions or face-lifts and biometrics, such as fingerprints and iris and face recognition, are susceptible to spoofing attacks, that is, the biometric identifiers can be copied and used to create artefacts that can deceive many currently available biometric devices.

In this Proposed FVRS – Mobile recognition unit, Finger vein[6] recognition unit is used. The finger-vein is a promising biometric pattern for personal identification in terms of its security and convenience. The vein is hidden inside the body and is mostly invisible to human eyes, so it is difficult to forge or steal. The non-invasive and contactless capture of finger-veins ensures both convenience and hygiene for the user, and is thus more acceptable. The finger-vein pattern[7] can only be taken from a live body. Therefore, it is a natural and convincing proof that the subject whose finger-vein is successfully captured is alive.

SYSTEM HARDWARE

ARM Processor:

The ARM7 family includes the ARM7TDMI, ARM7TDMI-S, ARM720T, and ARM7EJ-S processors. The ARM7TDMI core is the industry's most widely used 32-bit embedded RISC microprocessor solution. Optimized for cost and power-sensitive applications, the ARM7TDMI solution provides the low power consumption, small size, and high performance needed in portable,

embedded applications. The ARM7TDMI core uses a three-stage pipeline to increase the flow of instructions to the processor. This allows multiple simultaneous operations to take place and continuous operation of the processing and memory systems. As the processor is having a high speed it is easy to make the communication between the RF module and the Image acquisition module

Operating modes

The ARM7TDMI core has seven modes of operation:

- User mode is the usual program execution state
- Interrupt (IRQ) mode is used for general purpose interrupt handling
- Supervisor mode is a protected mode for the operating system
- Abort mode is entered after a data or instruction pre fetch abort.
  The interrupt setting of ARM supports the DHLS to response to the interrupt coming from the server section.

Interrupt controller

The Vectored Interrupt Controller (VIC) accepts all of the interrupt request inputs from the home server section and categorizes them as Fast Interrupt Request (FIQ), vectored Interrupt Request (IRQ), and non-vectored IRQ as defined by programmable settings. These interrupt settings will give aquick response to the RF decoder. So that address verification will be very faster and signal for image processing will be given to the image acquisition module.

Wireless communication:

RF communication:

Radio Frequency, any frequency within the electromagnetic spectrum associated with radio wave propagation. When an RF current is supplied to an antenna, an electromagnetic field is created that then is able to propagate through space. Many wireless technologies are based on RF field propagation

Transmitter:

The TWS-434 extremely small, and are excellent for applications requiring short-range RF remote controls. The TWS-434 modules do not incorporate internal encoding. If simple control or status signals such as button presses or switch closures want to send, consider using an encoder and decoder IC set that takes care of all encoding, error checking, and decoding functions

The transmitter output is up to 8mW at 433.92MHz with a range of approximately 400 foot (open area) outdoors. Indoors, the range is approximately 200 foot, and will go through most walls.

Figure 3: ***RF Transmitter***

RF receiver:

RWS-434: The receiver also operates at 433.92MHz, and has a sensitivity of 3uV. The WS-434 receiver operates from 4.5 to 5.5 volts-DC, and has both linear and digital outputs.

A 0 volt to Vcc data output is available on pins. This output is normally used to drive a digital decoder IC or a microprocessor which is performing the data decoding. The receiver's output will only transition when valid data is present. In instances, when no carrier is present the output will remain low.

The RWS-434 modules do not incorporate internal decoding. If you want to receive Simple control or status signals such as button presses or switch closes, you can use the encoder and decoder IC set described above. Decoders with momentary and latched outputs are available

Figure 4: ***RF receiver***

GSM

A GSM modem is a wireless modem that works with a GSM wireless network. Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication. GSM is the name of a standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900 MHz

GSM provides recommendations, not requirements. The GSM specifications define the functions and interface requirements in detail but do not address the hardware. The reason for this is to limit the designers as little as possible but still to make it possible for the operators to buy equipment from different suppliers. The GSM network is divided into three major systems: the switching system (SS), the base station system (BSS), and the operation and support system (OSS). The basic GSM network elements are shown in below *figure.*

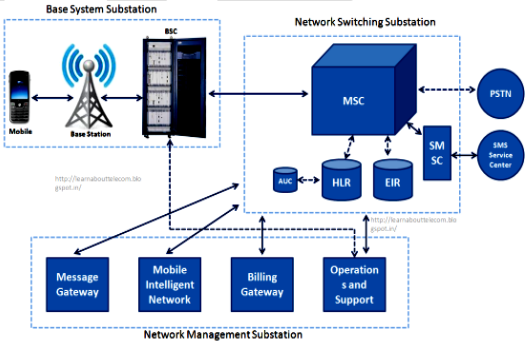


Figure 5: ***GSM network Topology***

GSM modems support an extended set of AT commands. These extended AT commands are defined in the GSM standards. With the extended AT commands, you can do things like:

- Reading, writing and deleting SMS messages.
- Sending SMS messages.
- Monitoring the signal strength.
- Monitoring the charging status and charge level of the battery.
- Reading, writing and searching phone book entries.

Sending the message :

To send the SMS message, type the following command:

AT+CMGS="+31638740161" <ENTER>

Replace the above phone number with your own cell phone number. The modem will respond with:

> (Response from the modem)
You can now type the message text and send the message using the <CTRL>-<Z> key combination:
Hello World ! <CTRL-Z>

Here CTRL-Z is keyword for sending an sms through the mobile device.After some seconds the modem will respond with the message ID of the message, indicating that the message was sent correctly:
+CMGS: 62

IMAGE AQUISTION

A color model is an abstract mathematical model describing the way colors can be represented as tuples of numbers, typically as three or four values *color components* (e.g. RGB and CMYK are color models). However, a color model with no associated mapping function to an absolute color spaceis a more or less arbitrary color system with no connection to any globally understood system of color interpretation.

Adding a certain mapping function between the color model and a certain reference color space results in a definite "footprint" within the reference color space. This "footprint" is known as a gamut, and, in combination with the color model, defines a new **color space**. For example, Adobe RGB and RGB are two different absolute color spaces, both based on the RGB model.

In the most generic sense of the definition above, color spaces can be defined without the use of a color model. These spaces, such as Pantone, are in effect a given set of names or numbers which are defined by the existence of a corresponding set of physical color swatches. This article focuses on the mathematical model concept.

RECOGNITION

Applications range from tasks such as industrial machine vision systems which, say, inspect bottles speeding by on a production line, to research into artificial intelligence and computers or robots that can comprehend the world around them. The computer vision and machine vision fields have significant overlap. Computer vision covers the core technology of automated image analysis which is used in many fields. Machine vision usually refers to a process of combining automated image analysis with other methods[12] and technologies to provide automated inspection and robot guidance in industrial applications.

As a scientific discipline, computer vision is concerned with the theory behind artificial systems that extract information from images. The image data can take many forms, such as video sequences, views from multiple cameras[11], or multi-dimensional data from a medical scanner.

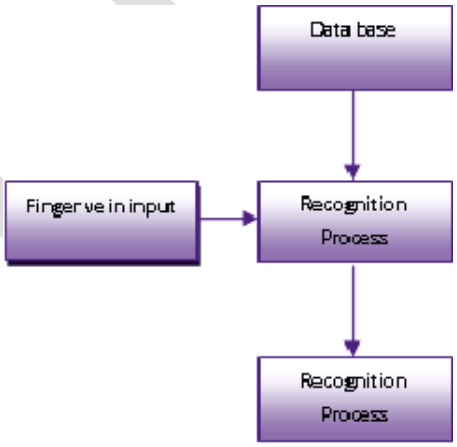
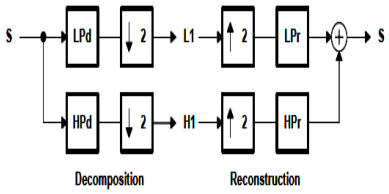


Figure 6 : ***FVRS image process method***

WAVELET ANALYSIS

The discrete wavelet transform (DWT) was developed to apply the wavelet transform to the digital world. Filter banks are used to approximate the behaviour of the continuous wavelet transform. The signal is decomposed with a high-pass filter and a low-pass filter. The coefficients of these filters are computed using mathematical analysis and made available to you.



Where

- LPd: Low Pass Decomposition Filter
- HPd: High Pass Decomposition Filter
- LPr: Low Pass Reconstruction Filter
- HPr: High Pass Reconstruction Filter

HAAR WAVELET ANALYSIS

In mathematics, the **Haar wavelet** is a sequence of rescaled "square-shaped" functions which together form a wavelet family or basis. Wavelet analysis is similar to Fourier analysis in that it allows a target function over an interval to be represented in terms of an orthonormal function basis. The Haar sequence is now recognised as the first known wavelet basis and extensively used as a teaching example.

DESIGN FLOW

The flow diagram of FVRS- Mobile unit is given below. It shows all the step by step function of finger vein recognition system. Initially the device will wait for an RF signal from the user to activate the communication between the embedded control unit and the image acquisition unit. Then the finger vein image of the user will be compared with the unique data base image. Then the authentication result will be send to the security number of the user.

Firstly initialize the image from the data base through the matlab then the image is resize to1/3 size for low noise image and go for histogram for the enhancement of the image and compare the image with user and database, if image is not compared then security number is get to the mobile, if image is compared then security number is get to the mobile through voice alert. According to the security number

The transaction of ATM is opened according to Bank name &Pin Number. After entering the pin number the transaction is being processed.

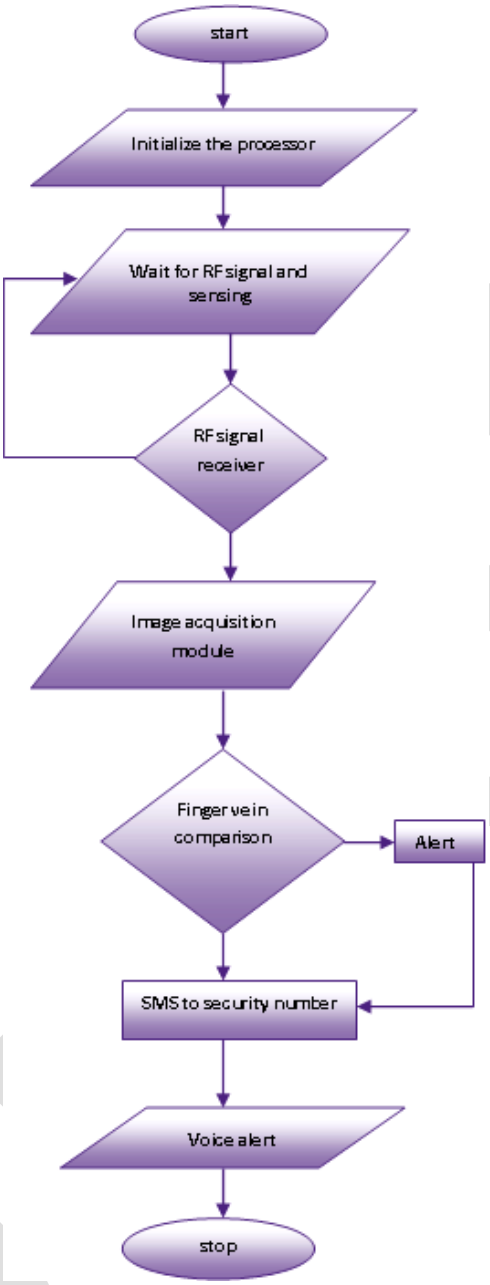


Figure 3: ***Flow diagram of FVRS***

CONCLUSION

Security is becoming essential in all kind of application. This project is implemented in a way to improve the security level. As the finger-vein is a promising biometric pattern for personal identification in terms of its security and convenience. Also the vein is

hidden inside the body and is mostly invisible to human eyes, so it is difficult to forge or steal. The non-invasive and contactless capture of finger-veins ensures both convenience and hygiene for the user, and is thus more acceptable. So this system is more hopeful in improving the security level.

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Simulation of Rainfall Runoff Using SCS &RRL

(Case Study Tadepalli mandal)

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Abstract— Rainfall data was collected for last five years including 2012 up to September in Tadepalli mandal Guntur district Andhrapradesh. The watershed is located in a geographical area between 16.4667°N latitudes and 80.6000°E longitudes. The rainfall data was collected from the nearby rain gauge which is located in an area of 61.5 sq km. SCS-CN method was used to calculate rainfall runoff using multiple linear regressions. In SCS-CN method different parameters like soil information, rainfall, storm duration, soil texture, type & amount of vegetation cover and conservation practices were considered. Based on the soil classification the given area falls under group C. Then the runoff is computed for different areas, namely barren land, industrial area, built-up, aquaculture, agricultural, forest and hilly areas. IRS-P4-LISS IV data was used to study the land use/land cover pattern of Tadepalli Mandal. The land use/land cover patterns were visually interpreted and digitized using ERDAS IMAGINE software. The study observed that agriculture area (46.72%) is dominant in Tadepalli Mandal. The raster data is processed in ERDAS and geo-referenced and then LU/LC map, drainage map, contour map, DEM (digital elevation model) is generated in GIS. Estimated runoff using SCS-CN & RRL is computed with runoff, simulated and actual rainfall data. In years 2008, 2009, 2010, 2011, 2012. In general good co-relation (r^2 =0.76) has been bound between observed and computed runoff.

Keywords— Watershed, Land use/land cover , SCS-CN, RRL, Runoff, Rainfall runoff modelling, DEM, ERDAS.

INTRODUCTION

INDIA has only 4% of the world's freshwater with 16% of world's population and 10% of its cattle. In the total geographical area of 329Mha,47% is cultivated, 23% forest,7% non-agricultural use area,23% waste land. So the use of available water should be done efficiently to meet the people's needs. In order to have accurate idea of available water runoff is to be computed. Hydrological modeling is a powerful technique of hydrologic system investigation for both the research hydrologists and the practicing water resources engineers involved in the planning and development of integrated approach for management of water resources.

Hydrologic models are symbolic or mathematical representation of known or assumed functions expressing the various components of a hydrologic cycle**. Le Bao Trung** used Soil and Water Assessment Tool (SWAT) distributed parameter model for the simulation of runoff and tested on daily and monthly basis for estimating surface runoff and sediment yield for small watershed. A rainfall-runoff model is a mathematical model describing the rainfall - runoff relations of a catchment area, drainage basin or watershed. More precisely, it produces the surface runoff hydrograph as a response to a rainfall hydrograph as input. In other words, the model calculates the conversion of rainfall into runoff. A rainfall runoff model can be really helpful to the present work in the case of calculating discharge from a basin. The transformation of rainfall into runoff over a catchment is known to be very complex hydrological phenomenon, as this process is highly nonlinear, time- varying and spatially distributed. Over the years researchers have developed many models to simulate this process. Based on the problem statement and on the complexities involved, these models are categorized as empirical, black-box, conceptual or physically-based distributed models. Physically based distributed models are very complex and required too many data and tedious for the application purpose.

Computer simulation of catchment water balance for estimating runoff from rainfall began in the early 1960s **(**Boughton, 2005**).** It is now the major technology for management of water resources and for hydrological design work, and many different models are available for use. It is a common adage that, if given good quality data, any of the modern water balance models will give good quality results, but none will give good results with poor quality data. In other words, the results from rainfall-runoff modelling are more dependent on the quality of the input data than on the model. There is evidence for this in at least two major modelling studies undertaken in Australia. **Nathan and McMahon (1990a, b)** calibrated the SFB model on 168 catchments, 250 km^2 in area, in south-

eastern mainland Australia. Rainfall data for the study were provided by the Bureau of Meteorology and runoff data by the main stream flow measuring authorities in New South Wales and Victoria. The model was found to be satisfactory in these words: ‘‘Overall, it is concluded that the SFB model is robust and simple to use, and given good input data, it is generally possible to achieve an acceptable calibration’’. The data were commented on in these words: ‘‘.calibration results with (a coefficient of determination) less than 0.6 or (overall difference between observed and simulated flow volumes) greater thanG10% are generally too poor to be considered acceptable and are of little practical benefit; approximately 37% of the calibrations undertaken fall into this category. These poor calibration results were generally associated with catchments in which the water balance problems infer that the rainfall and evaporation data were not representative of catchment conditions’’.

The quality of more than one-third of data in this study was too poor to be useable. This is not a criticism of the authorities providing the data. It serves to demonstrate how difficult it is to get input data of sufficient quality to be able to model the water balance of catchment areas.

RESEARCH SIGNIFICANCE

India has 2% of world’s land, 4% of fresh water, 16% of population and 10% of cattle. From the total geographical area of 329Mha, the land use reported for different purposes has been 47% for cultivation, 23% for forests, 7% for non-agri use and 23% as unutilized. The percapita land availability 50 years back was 0.9 ha and it could be only 0.14ha in 2050.Inorder to meet the consequences, there is an urgent need for the optimal utilization of the rain water available. In this direction, rainfall –runoff model will help in knowing the amount of runoff so that the alternate cropping pattern can be suggested for the available water.

OBJECTIVES

The scope and objectives of the present project are:

- To delineate Tadepalli mandal and extraction of land use/land cover using RS & GIS
- To determine runoff potential in Tadepalli mandal using SCS method.
- Compute runoff model using SCS-CN.
- To develop and test the performance of SCS-CN models for simulation of runoff at Tadepalli mandal.

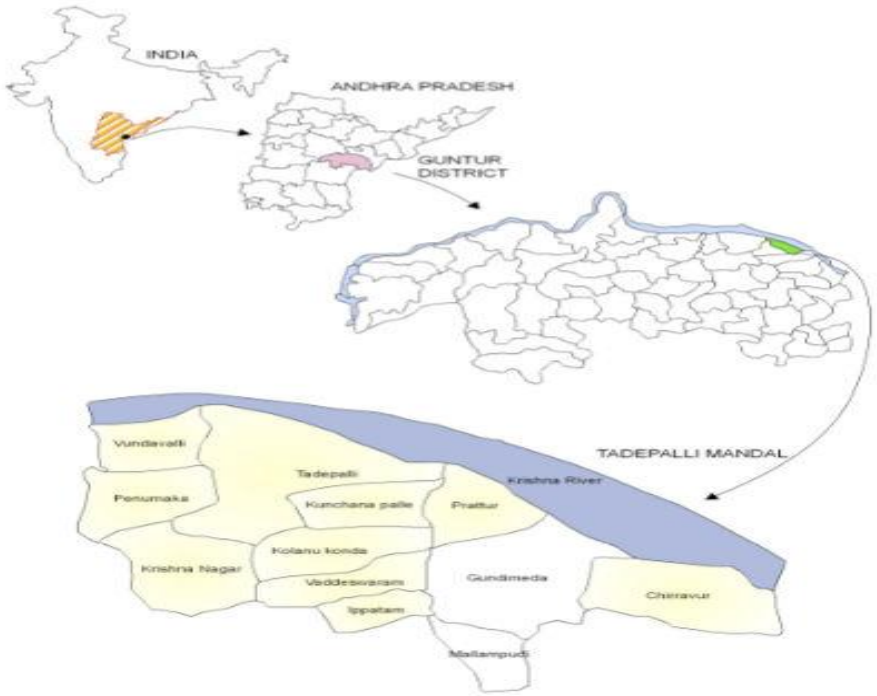

Fig: 1 Location map

Study Area

Tadepalli mandal is situated in the 16.4667°N latitudes and 80.6000°E longitudes.It is having a total geographical area of 11000 ha,out of which the total cultivated area is 3300 ha. It consists of 12 villages namely

1. Tadepalli
2. Undavalli
3. Penumaka
4. Krishnanagar
5. Vaddeswaram
6. Kolanukonda
7. Ippatnam
8. Mellampudi
9. Kunchanpalli
10. Pratur
11. Gudimenda
12. Chirravuru

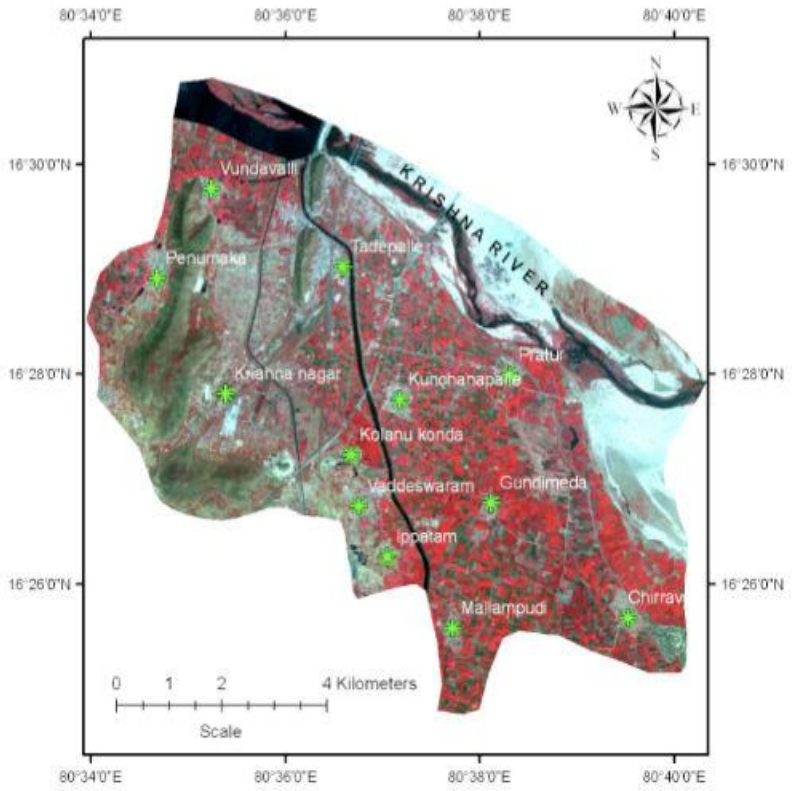

Fig: 2 Imagery of the study area

SCS-CN METHOD OF ESTIMATING RUNOFF VOLUME

SCS-CN method developed by Soil Conservation Services (SCS) of USA in 1969 is a simple, predictable and stable conceptual method for estimation of direct runoff depth based on storm rainfall depth. It relies on only one parameter, CN. Currently, it is a well established method, having been widely accepted for use in USA and many other countries. The details of the method are described in the section. The SCS-CN method is based on the water balance equation and two fundamental hypotheses. The first hypothesis equates the ratio of the amount of direct surface runoff Q to the total rainfall P (or maximum potential surface to the runoff) with the ratio of the amount of infiltration Fc amount of the potential maximum retention S. The second to the potential hypothesis relates the initial abstraction Ia maximum retention. Thus, the SCS-CN method consisted of the following equations

(a) Water balance equation:

Proportional equality $P = Ia + Fc + Q$ ….....(1)

Hypothesis $Q/(P - Ia) = Fc/S$ .....(2)

I - S hypothesis: $Ia = \lambda S$ .....(3)

Where,

P is the total rainfall, Ia the initial abstraction, Fc the cumulative infiltration excluding Ia, Q the direct runoff, S the potential maximum retention or infiltration and λ the regional parameter dependent on geologic and climatic factors ($0.1<\lambda<0.3$).

Solving equation (2)

$$Q = (P - Ia)2 /(P - Ia + S) .....…(4)$$

$$Q = (P - \lambda S)2 /(P - (\lambda - 1)S) ….....(5)$$

The relation between Ia and S was developed by analyzing the rainfall and runoff data from experimental small watersheds and is expressed as Ia=0.2S. Combining the water balance equation and proportional equality hypothesis, the SCS-CN method is represented as

$$Q = (P - 0.2S)2 /(P + 0.8S) ….....(6)$$

The potential maximum retention storage S of watershed is related to a CN, which is a function of land use, land treatments, soil type and antecedent moisture condition of watershed. The CN is dimensionless and its value varies from 0 to 100.The S-value in mm can be obtained from CN by using the relationship

$$S = (25400 /CN) - 254 ……(7)$$

Estimation of mean rainfall over the basin

The daily rainfall data for raining months (May, June, July, August, and September) of the year were used to estimate daily runoff. The four years (2008, 2009, 2010, 2012) daily rainfall data of two rain gauge station was used to estimate runoff. The rain gauge

represent only point sampling of the areal distribution of rainfall but rainfall over the catchment is never uniform. Therefore to identify which rain gauge stations contribute to mean annual rainfall over the entire Buckingham canal a Thesien polygon method was used. The Arc-GIS software was used to develop polygon and to calculate the area of polygons for more accuracy. The Thiessen weightage for each raingauge station was calculated and used to calculate mean areal rainfall over the area. The statistic of Thesien polygon of buchingam cannel basin. It was observed that tadepalli raingauge station has most influence in the basin followed by tadepalli. The raingauge station tadepalli has least influence in the basin. Thesien polygon statistic of Buckingham canal

Curve Number map

Curve number is the governing factor, which predominantly affect the runoff amount which flows over the land after satisfying all loses. Although curve number itself having no physical meaning but also plays an important role in defining hydrological response. Curve number varies from 0 to 100. Zero curve number describes the hydrological response only with infiltration. All the rainfall water will infiltrate to become subsurface flow. Whereas 100 curve number describes the hydrological responses of no infiltration. All the rainfall water will flow as surface flow as soil is in saturation limit that happens in continuous rainfall events. As 100 curve number is given to water bodies. CN values lies between 0-100 contribute the flow in both forms. As soon as CN is increased, runoff from that watershed will also increase. As explained earlier CN is derived from Land use/Land cover classification and hydrological soil group the land use coverage and soil coverage were merged using *UNION* command of Arc-GIS software. Using ARC-GIS software total 78 polygons were developed. All these polygons having a particular land use and a hydrologic soil group and then curve numbers were assigned to these polygons. Thus a curve number coverage was generated in which different polygons had different curve number values. The pictorial presentation of CN for various land cover and Hydrological soil group is presented spatial distribution of Curve Number of Buckingham canal

Estimation of Runoff

The distributed CN technique was used to estimate runoff for Buckingham canal. An initial abstraction (I_a) of 0.2S was used, where S is the maximum potential retention discussed in section The CN value for each polygon was used to calculate maximum potential retention S for each polygon by using Equation 3.11. Then runoff of each polygon was estimated with the help of Equation The daily runoff of all raining months May, June, July, August, September were estimated for 4 year period (2008-,2009,2010,2011,2012) using daily rainfall data of these months. The daily runoff was converted into monthly runoff. The graphical representations of monthly runoff potential for years (2008, 2009, 2010, 2011, and 2012) were presented in respectively.The spatial distribution of runoff depth in wet year, dry year and normal year is presented in the respectively.

Land Use/ Land Cover Classification

Indian Remote Sensing satellite digital image with specifications described under section were classified using maximum likelihood classifier. The classified images of Buckingham canal are presented The graphical representations of LU/LC statistics of theBuckingham canal are also given whereas tabular form is displayed in which shows comparative analysis of land covers variation in basin.As seen fromit was found that the Buckingham canal comprises of eight different types of LU/LC. However, the major land use is agriculture (64.72%) followed by Plantation (19.44%). Other LU/LCs comprising of water bodies, barren land, reserve forest, hilly areas, aquaculture and settlement account for about 16% of the total area of the watershed. The basin has 5.51 % barren land, 4.55 % hilly areas,1.58% reserved forest, 0.82 % water tanks and aquaculture is also present in that area (0.26 %). Buckingham canal 3.12 % area is covered by settlement.

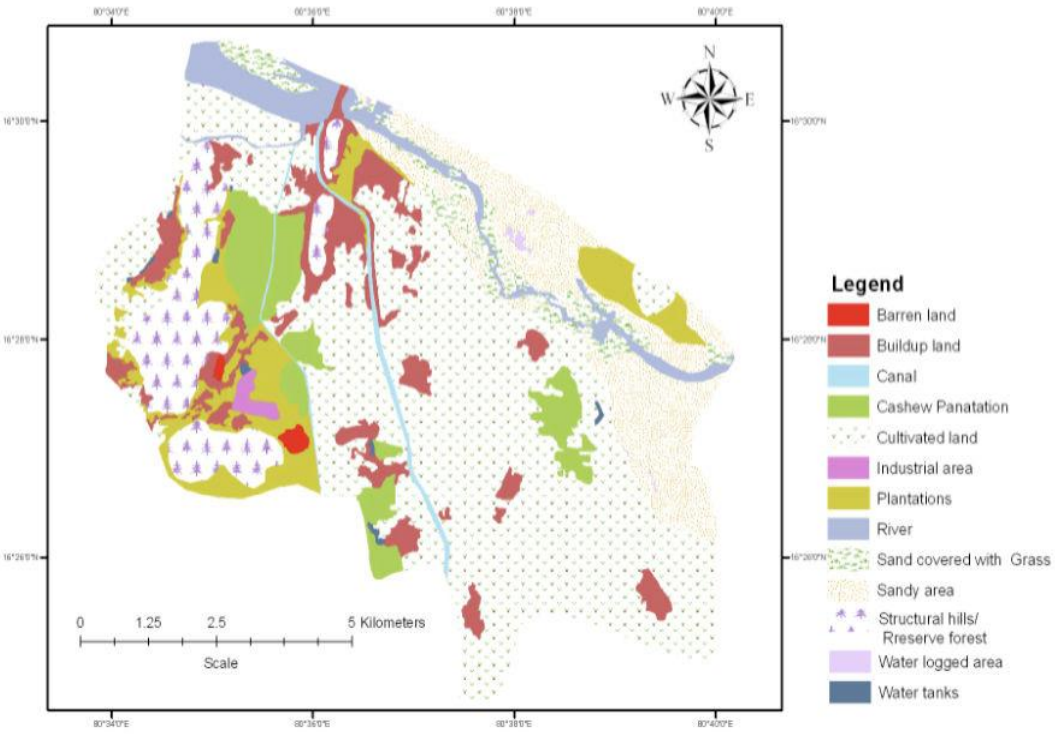

Fig: 3 Land use/Land cover

Data Input and Software Used

To achieve the above objectives, daily precipitation and runoff data for period of ten years (1998,2009,2010,2011,2012), soil data, topographic maps and satellite imagery of the study area are collected. ERDAS IMAGINE 8.5 and ARC GIS 9.2 software packages were used for analyzing the data. MATLAB 2009a was used to run the code which was developed to find optimized AWBM model.

The Survey of India toposheets covering the study area were scanned, rectified and digitized for elevation contours, drainage network, and prominent land cover using ARC-GIS software. The river basin was divided into micro-units (micro basins) using Arc-Swat software. All geomorphologic parameters like canal parameters were extracted using Arc-GIS. The IRS satellite images for the year 2010 were classified using supervised classification (after several ground truth verifications) withmaximum likelihood classification algorithm in ERDAS IMAGINE software.

Land Use/ Land Cover Classification

Indian Remote Sensing satellite digital image with specifications described under section were classified using maximum likelihood classifier. The classified images of Buckingham canal are presented. The graphical representations of LU/LC statistics of the Buckingham canal are also given whereas tabular form is displayed in which shows comparative analysis of land covers variation in basin. As seen from it was found that the Buckingham canal comprises of eight different types of LU/LC. However, the major land use is agriculture (64.72%) followed by Plantation (19.44%). Other LU/LCs comprising of water bodies, barren land, reserve forest, hilly areas, aquaculture and settlement account for about 16% of the total area of the watershed. The basin has 5.51 % barren land, 4.55 % hilly areas, 1.58% reserved forest, 0.82 % water tanks and aquaculture is also present in that area (0.26 %). Buckingham canal 3.12 % area is covered by settlement.

Table: 1 Land use/Land cover classification statistic of Buckingham canal

Land use/Land cover classes	Area (Km^2)	Area (%)
Barren Land	3.388	5.51
Settlement	1.91	3.12
Water Tanks	0.504	0.82
Agriculture	39.802	64.72
Hilly Area	2.79	4.55
Plantation	11.95	19.44
Reserve Forest	0.9717	1.58
Aquaculture	0.159	0.26
Total	61.466	100

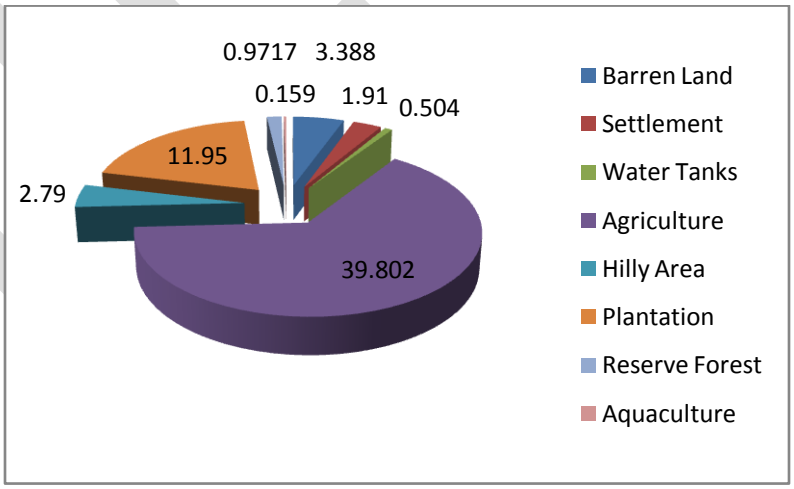

Fig: 4 Land use/ land cover statistics of tadepalli watershed and its sub watersheds

Spatial and Temporal Variation in Rainfall

Daily rainfall data was collected from one rain gauge station of Buckingham canal for a period of 2008, 2009,2010,2011,2012. Graphically these data were represented as plots of magnitude vs chronological time in the form of a bar diagram It was observed from the Figure that rainfall varies with respect to space and time in the Buckingham canal. Based on this plots we can analysis of rainfalls of a time period in the area and can provide the information of average annual rainfall of that time period, information of wet years, dry years and normal years. The average annual rainfall calculated and present with bar diagram, as horizontal line

The years which were above than average annual rainfall are the wet years.25 % departure from the average annual rainfall was also calculated and presented with bar diagram, as horizontal line shown in. The years which were below than 25 % departure from the average annual rainfall are the dry years. The years which were in between average annual rainfall and 25 % departure from the average annual rainfall were classified as normal years. Based on the analysis of rainfalls2008, 2009,2010,2011,2012 in the study area, the year 2010 was characterized as the 'wet year' because the station has a rainfall above than average annual rainfall, the year 2008 as the 'dry year' because the rainfall at most of the station was below 25 % departure from the average annual rainfall and the year 2009.2011 as the 'normal year' because rainfall at five stations were more than average annual rainfall, only one station have rainfall less than average annual rainfall but more than 25 % departure from the average annual rainfall.

Graphically representation of mean monthly rainfall vs months provides the information about the rainy months of the year. Therefore, Mean monthly rainfall of each month was calculated for year 2008,2009,2010,2011,2012and bar diagram of mean monthly rainfall vs months was plotted as shown identify rainy months of the year. It was observed from the that only six months (May, June, July, August, September and October) are the raining months of the year and able to produce considerable amount of runoff in the area

Data Input and Software Used

To achieve the above objectives, daily precipitation and runoff data for period of ten years (2008, 2009, 2010, 2011, and 2012), soil data, topographic maps and satellite imagery of the study area are collected. ERDAS IMAGINE 8.5 and ARC GIS 9.2 software packages were used for analyzing the data. MATLAB 2009a was used to run the code which was developed to find optimized AWBM model.

The Survey of India toposheets covering the study area were scanned, rectified and digitized for elevation contours, drainage network, and prominent land cover using ARC-GIS software. The river basin was divided into micro-units (micro basins) using Arc-Swat software. All geomorphologic parameters like canal parameters were extracted using Arc-GIS. The IRS satellite images for the year 2010 were classified using supervised classification (after several ground truth verifications) with maximum likelihood classification algorithm in ERDAS IMAGINE software.

Table: 2 Average, Observed and RRL values for years 2008, 2009, 2010, 2011, 2012.

Month	2008	2009	2010	2011	2012	Average	Observed	RRL
January	4.2	0	0	0	0	4.2	0	0
February	0	0	0	36.4	0	36.4	59	0
March	0	0	0	0	3.6	3.6	15	25
April	7.4	0	13	35.4	5.8	61.6	60	0
May	0	104.8	292.2	10.8	15.4	423.2	189	257.89
June	90.6	5.6	97.6	96.6	112.2	402.6	19	122
July	221.84	122.8	423.8	327.2	240.6	1336.24	210	191.568
August	170.8	235.2	468.2	290.6	150	1314.8	370	366.912
September	159.8	215.4	300.2	18.2	300	993.6	370	336.024
October	179	64	193.8	56.4	79	572.2	79	99.84
November	33.8	145.8	84.8	0	100	364.4	400	227.448
December	0	0	103	2.4	0	105.4	97	0

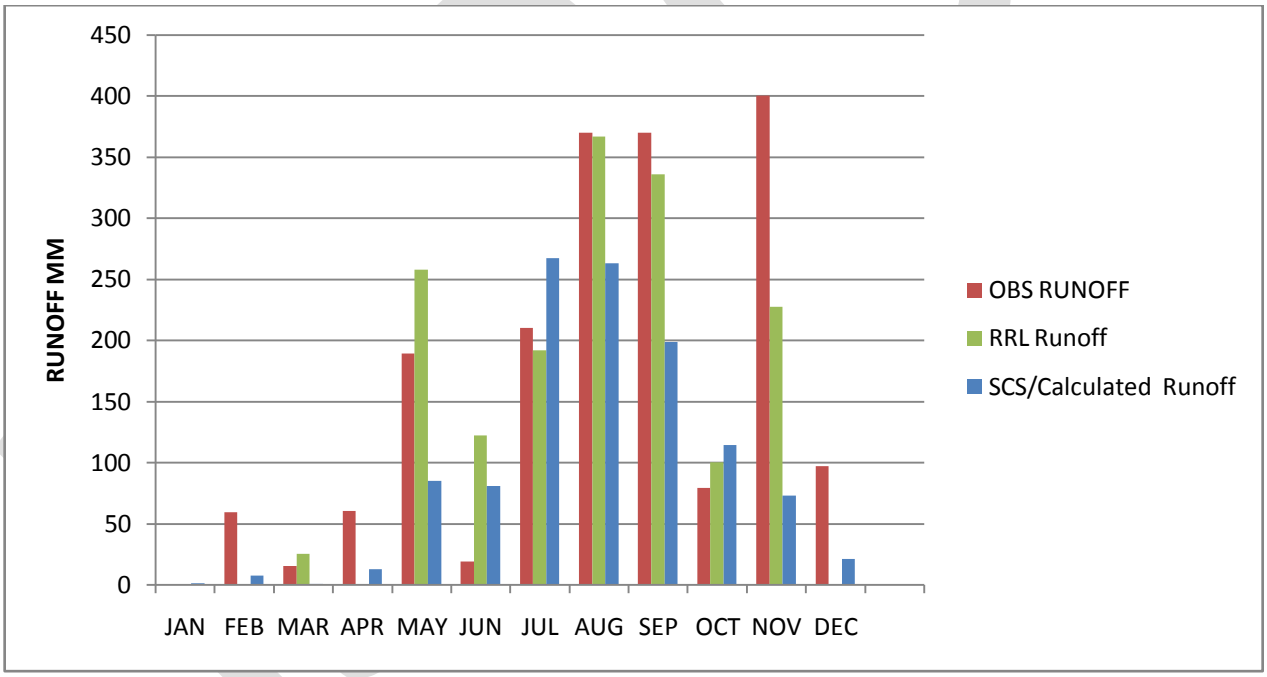

Fig: 6 Observed (OBS) Runoff, RRL Runoff, and SCS/Calculated Runoff

. Results and Discussion:

1. The average monthly rainfall calculated was more for months may, June, July, August, September.

2. The Observed rainfall was more in months July, august, September and November.
3. The year 2010 is the wet year compared to all five years.
4. 2009, 2011 had the least rainfall compared to all the years.
5. The RRL values were more in the months May, July, August, September and November.

Conclusion:

1. Based on the annual rainfall analysis at one rain gauge station of the study area for period 2008,2009,2010,2011,2012 , the year 2010 can be characterized as the 'wet year', the year 2009,2012 as the 'dry years' and the year 2012 as the 'normal year'.
2. Based on the mean monthly rainfall analysis at one rain gauge station of the study area for period
3. 2008,2009,2010,2011,2012 , the months May, June, July, August, September and October are characterized as raining months of the year.

Future scope

The estimation of runoff can be calculated by using RRL and SCS- CN methods for different areas and by further detailed process by using different methods.

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Locating the Cargo Terminals in the Province of Kohgiloyeh & Boyer Ahmad

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Abstract— Cargo terminals are as one of the main components of road transport system that by which we can provide services and facilities to the drivers and the fleet of transportation, centralized and coherent, and so we can make policy, conduct, and have necessary control and supervision the system of road transportation.

One of the main problems in the transport sector of kohgiloyeh & Boyer Ahmad's province is wandering trucks for finding and loading of the goods in urban areas that it caused to increase the number of accidents, environmental pollution and noise pollution, and so on. It also undermines the possibility of supervision on their activities. Considering the present situation, organizing the transportation of goods was a necessity, that as cargo terminals localization in the province of Kohgiloyeh & Boyer Ahmad were studied.

Methods used to locate cargo terminals are regional planning techniques including, spatial analyses of land use and traffic flow analysis in the major roads. Geographical Information Systems (GIS) is used to visualize the results clearly. The findings of the above mentioned techniques in totally gave the priority of construction of the cargo terminals to the roads of Yasuj-Babamaidan weighing 40, Yasuj-samirom weighing 36, Dogonbadan-Behbahan weighing 28, Dogonbadan-Babamaidan weighing 27, Dogonbadan-Behbahan weighing 25, and Yasuj-Sepidan weighing 25, respectively.

According to the research findings and the multiplicity of goods transport's companies in the province and the need to construct a terminal in each territory, places suitable for construction of the cargo terminals were selected respectively in Boyer Ahmad territory, the 15-20 km of Yasuj-Babamaidan road, in Gachsaran territory, centered 5 kilometer of Dogonbadan-Behbahan road, and in kohgiloyeh territory, the beginning of Dehdasht-Behbahan road.

Keywords— Goods transportation, cargo terminals, locating, GIS, regional planning, spatial analysis, kohgiloyeh & Boyer Ahmad province

INTRODUCTION

Road transportation due to its special characteristics, is known as a common mode of transportation in different countries and in our country i.e. Iran. it's as most popular mode for transport goods and passengers. This makes necessary attention to the road transportation system in order to increase efficiency and improve performance of it. Increasing the efficiency of road transportation system requires coordinated development of all its components and subsets including fleet transportation, drivers, road network, road facilities, terminals, etc. [5, 10]. Accordingly proper locating and then construction of cargo terminals as one of the most important components and infrastructures of road transportation is a necessity that through which we can provide services and facilities to the drivers and the fleet of transportation, centralized and coherent, and so by which make policy, conduct and have necessary control and supervision the system of road transportation [2, 6]. In this regard in Kohgiloyeh & boyerahmad province, organizing goods

transportation was a necessity that as locating cargo terminals in Kohgiloyeh & boyerahmad province has been studied. Selecting an appropriate location for the project is very important. This requires extensive investment in projects that have been more sensitive [7]. In other words, incorrect locating of a project it means non-optimal use of investment and waste of time, manpower, investment and resources and ultimately inefficiency of the project. Since the construction of cargo terminals require large investment amounts and reaching to the expected goals at first degree is subject to its correct location, locating must be performed with high accuracy [8].

RESEARCH METHODOLOGY

In this study to locate cargo terminals in the province of Kohgiloyeh & Boyer Ahmad we used the techniques of spatial analysis of land use and traffic flow analysis in the major roads that are most commonly used for regional planning [1]. Geographical Information Systems (GIS) is used to visualize the results clearly [3].

A. Spatial Analysis Of Land Uses At Regional Level

In this method, variables and indicators that could help us to locate cargo terminals in the province of Kohgiloyeh & Boyer Ahmad, analytically were reviewed and analyzed that included: urban and rural centers of excellence (in terms of population growth), major centers of activity (agriculture, industry, mining, services), regional development roads, industrial poles, agricultural poles, and transportation road networks [1].

B. Traffic Flow Analysis

In this method by surveying the traffic flow (with an emphasis on freight vehicles) on the road network of the province, by electronic devices that were installed in the road surface, can determine the priority of roads for construction of the cargo terminals [4]. In this study the results of the traffic flow for the year of 2009 has been used to analyzing the traffic flows of the roads.

STUDY AREA

The study area for this research is Kohgiloyeh & Boyer Ahmad province, a relatively small province in the southwest of Iran. Total length of road network of this province including highways, main roads, secondary roads, gravel roads, and other roads (excluding the urban roads) is 2373 kilometer (see figure 1).

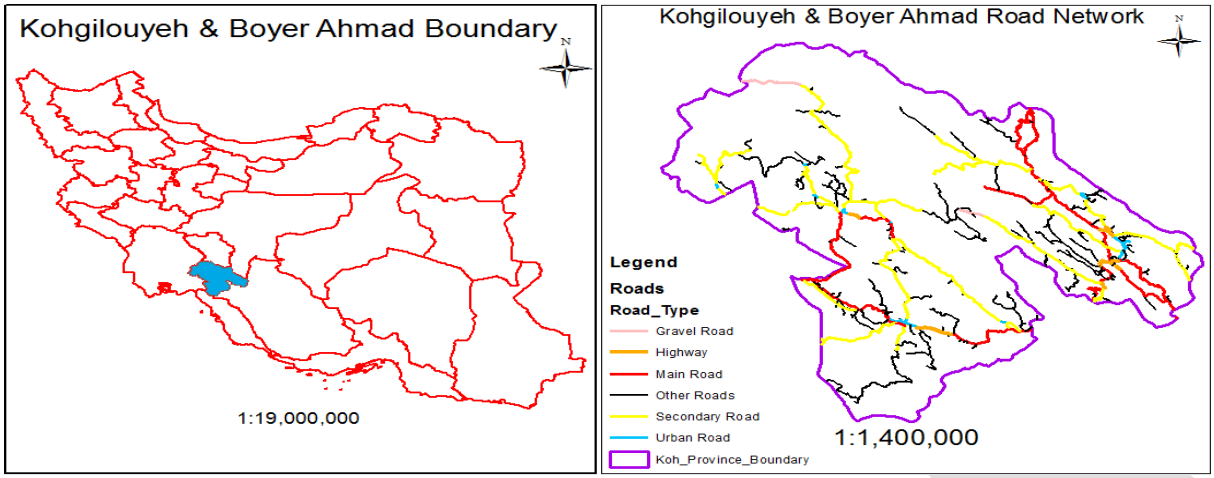

Figure1: Map showing a) Boundary of the study area i.e. Kohgilouyeh & Boyer Ahmad province – Iran, b) Road network of the study area

Maps collected from different sources. Atlas of Iran road network collected from RMTO (Road Maintenance & Transportation Organization of Iran), scanned, Georeferenced, and used as a base map for digitizing the road network. Digitization of roads has done in Google earth based on Iran atlas of road network. Digitized maps are exported to ArcGIS 10.1 and the format is converted to shape file (.shp).

RESULTS AND DISCUSSION

According to the methods used for locating, the use of spatial analysis technique and traffic flow analysis technique, the following results were obtained:

A. Spatial Analysis Of The Uses At Regional Level

Urban And Rural Centers Of Excellence

From view point of the population growth in urban areas, most growth concentration has been placed in eastern and southern regions of the province, which in the meantime up to 2000 the greatest growth in urban areas occurred in the South, East and so in the provincial capital. Generally the cities Yasuj, Dogonbadan, and Dehdasht have a high potential of population growth. From the view point of population growth in rural areas, most concentration has been placed in the East, North and West of the province [9].

Major Activity Centers

Agricultural Centers

Major agricultural areas of the province have been developed in South and West of the Province (crops) and the North and East (garden products) that of which in the south of the province, lishter plain in Gachsaran territory and in the east of province, tourist area of Sisakht(capital of Dena territory) near Yasuj city can be mentioned [9].

Industrial and Manufacturing Centers

From view point of industrial activities and industrial Estates, the most concentration of industries has placed in south of Yasuj city and in the Yasuj - Babamaidan road. After it the highest concentration of industries have settled in the West of Dogonbadan city and in the Dogonbadan - Behbahan road and after these two, the highest concentration of industries have placed in the West of dehdasht city and in the Dehdasht - Shahreza road (in the continuation of Dehdasht - Behbahan road). Meanwhile, the cement factory of Yasuj with the potential of daily production of 130 thousand tons of cement is located in the south of Yasuj city and in the 20th kilometer of Yasuj - Babamaidan road [12].

Mining Centers

Major mines in the province have been distributed in the East, South and West of the province. As rubble and limestone mines exist in the East of Boyerahmad territory and gypsum mines exist in the South and West of Province i.e. Gachsaran and kohgilouyeh territories [12].

Services

In context of Premier services in the province, Yasuj city (provincial capital) and then, Dogonbadan and Dehdasht cities as poles of services and facilities are considered.

Ways of Development and Transportation

The main ways of development are Yasuj - Babamaidan, Yasuj - sepidan, Yasuj - samirom, Dogonbadan - Behbahan and Dehdasht - Behbahan roads that all are important to transportation in the province.

With assigning a weight to each of the above criteria and assigning the maximum weight of 20 for each road, the following results were obtained in relation to the major roads (Table 1).

Table 1: Results for spatial analysis of the uses at regional level

Criteria / **Road**	Urban and rural centers of excellence	Agricultural centers	Industrial centers	Mining centers	Services	**Total Weight**
Yasuj - Babamaidan	4	4	4	4	4	**20**
Yasuj - Sepidan	4	3	3	3	4	**17**
Yasuj - Samirom	4	3	3	4	4	**18**
Dogonbadan-Babamaidan	2	1	2	1	2	**8**
Dogonbadan - Behbahan	2	3	2	2	2	**11**
Dehdasht - Behbahan	3	2	2	4	1	**12**

B. Traffic Flow Analysis In The Roads

Evaluation of traffic flow of freight vehicles in the roads of Kohgiloyeh & Boyer Ahmad province in 2009 and assigning a weight to each mentioned criteria in relation to major roads of the network, the following results were obtained [11](Table 2).

Table 2: Results for traffic flow analysis in the roads

Criteria / Road	Flow of freight vehicles(vehicle-day)	Weight
Yasuj - Babamaidan	1666	**20**
Yasuj - Sepidan	655	**8**
Yasuj - Samirom	1519	**18**
Dogonbadan - Babamaidan	1530	**19**
Dogonbadan - Behbahan	1413	**17**
Dehdasht - Behbahan	893	**13**

The results are summarized in the traffic flow analysis in the roads and spatial analysis of land use techniques, gave the priority for construction of cargo terminals, respectively, to the Yasuj - Babamaidan, Yasuj - Samirom, Dogonbadan - Behbahan, Dogonbadan - Babamaidan, Dehdasht - Behbahan and Yasuj - Sepidan roads as the results are shown in table 3.

Table 3: Results for spatial analysis of the land use and traffic flow analysis in the roads together

Road	Cumulative Weight
Yasuj - Babamaidan	40
Yasuj - Sepidan	25
Yasuj - Samirom	36
Dogonbadan - Babamaidan	27
Dogonbadan - Behbahan	28
Dehdasht - Behbahan	25

CONCLUSION

According to the research findings and the multiplicity of goods transport companies in the province and the need to build a terminal in each territory, places suitable for the construction of cargo terminals are proposed as follows. (1) Major population centers, agricultural, industrial and ways of development and transportation, mostly ended to the capitals of territories in the province i.e. Yasuj, Dogonbadan and Dehdasht. So the priority for construction of cargo terminal is leading to this cities. (2) Among the cities mentioned above with regard to all properties described and the share of province's territories of the number of goods transport companies and institutions, the priority for construction of cargo terminal, respectively, are in the roads leading to Yasuj, Dogonbadan and Dehdasht cities. (3) Since the establishment of cargo terminal usually considered near the entrance of cities and industrial centers, agricultural centers, manufacturing centers and the roads with high traffic flow (freight fleet flow), so the site of construction of Yasuj's cargo terminal at 20th kilometer of Yasuj - Babamaidan road (nearby cement factory of Yasuj), the site for construction of

Dogonbadan's cargo terminal at 5th kilometer of Dogonbadan - Behbahan road (adjacent to chaharbisheh's industrial town) and the site for construction of Dehdasht's cargo terminal at the beginning of Dehdasht - Behbahan road are proposed (see figures 2 to 4).

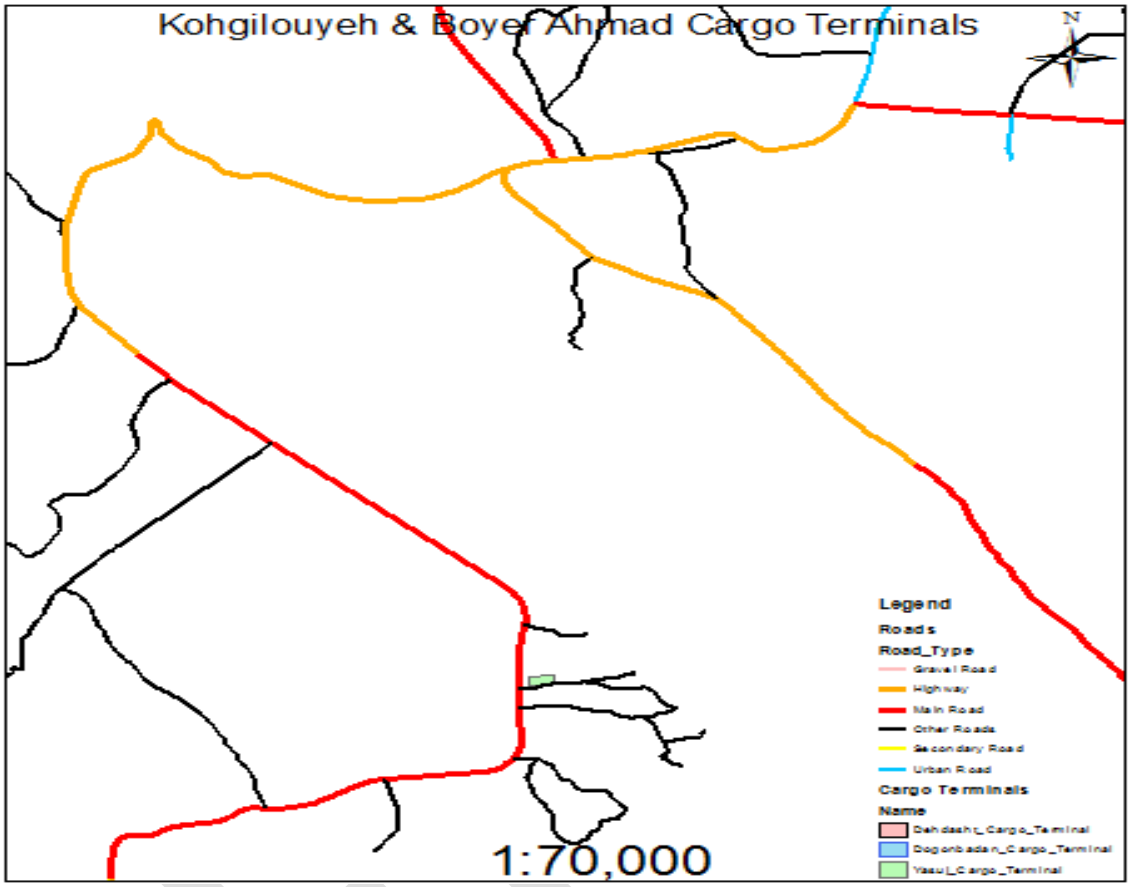

Figure 2: Map showing 1st priority for construction of cargo terminals in the study area i.e. Kohgilouyeh & Boyer Ahmad province – Iran

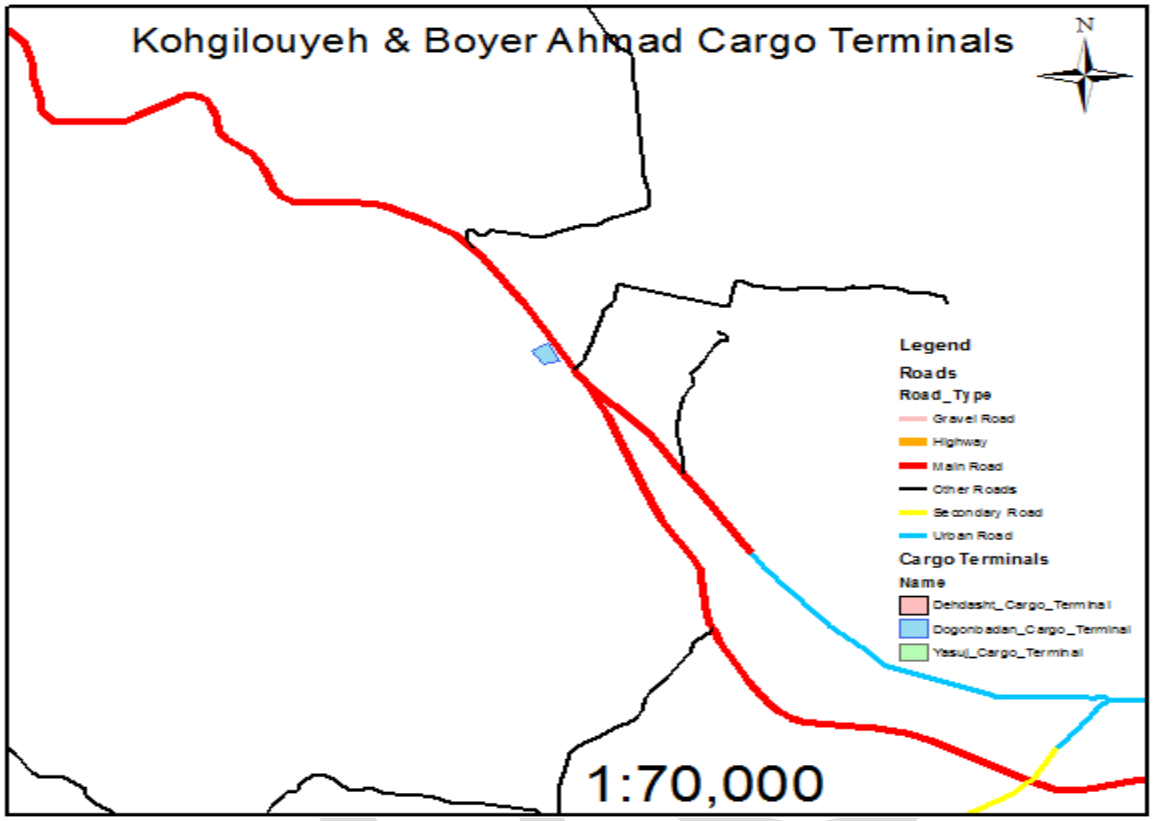

Figure 3: Map showing 2nd priority for construction of cargo terminals in the study area i.e. Kohgilouyeh & Boyer Ahmad province – Iran

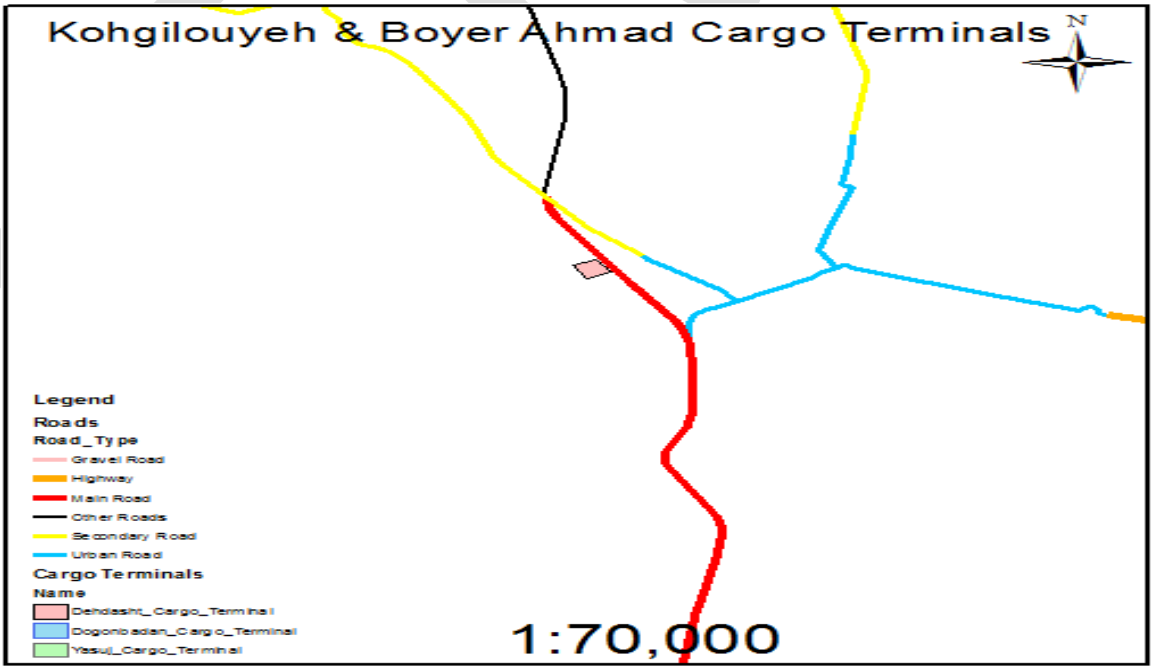

Figure 4: Map showing 3rd priority for construction of cargo terminals in the study area i.e. Kohgilouyeh & Boyer Ahmad province – Iran

Construction of cargo terminals at these locations will cause the increment in efficiency of terminal, reduction of waste trade in the urban areas due to find and loading of goods, increment in traffic safety in urban areas and better responsibility to the transportation demand and finally transportation development in the province [3].

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SECURED LANDFILLS FOR DISPOSAL OF MUNICIPAL SOLID WASTE

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Abstract—
A landfill is a facility which is designed for the safe disposal of solid wastes. The bottom liners and a top Cover, of the landfill are considered as the most critical components. Penetration of Leachate in to the soil is the major problem in landfills. For existing landfills the main factor affecting the quality of liners/covers is its permeability which should not be greater than 1.0×10^{-9} m/sec. Alternative materials which can be used as liners are compacted ball clay, vitrified ceramic tiles, limestone slabs which have permeability relatively less compared to compacted clay. The compacted ball clay in the form of tiles (green) had undergone heavy compaction which in turn reduces permeability and the thickness of the liners/covers. By reducing the thickness of liners more amount of municipal solid waste can be accommodated. Usage of alternative materials will reduce the overall thickness of liner system by about 40-50cm

Index Terms— Municipal solid waste, Leachate, Liner/Cover, Permeability, porosity, compacted Ball clay tiles (green), Amended soil, Ceramic tile

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INTRODUCTION

Solid waste may be defined as generation of undesirable substances which is left after they are used once. They cannot be reused directly by the society for its welfare because some of them may be hazardous for human health [1]. At present, the annual generation is approximately 1.6×10^9 ton in India [2]. Land filling has been the most common method of solid waste disposal [3].

The central problem in landfill disposal is leachate control and thickness of liners and covers. A surface seal landfill design is recommended for maintaining the dry state of solid hazardous wastes and for controlling leachate [5]. Bottom liner and top cover plays very important role in reducing the leachate quantity [6].

PRESENT PRACTICES OF SOLID WASTE DISPOSAL

Various practices are Non-engineered disposal which means open dumping. Land filling is disposal of waste with different liners and finally with earth cover. Incineration is burning of solid waste. Pyrolysis is a form of incineration that chemically decomposes organic materials at high temperature in the absence of oxygen. Vermicomposting in which earthworms feed on the organic matter present in the solid waste and convert into casting. Composting is biodegradation of organic matter. Reuse & Recycling of waste materials. Energy generation by subjected decomposing organic material to digestion [1].

ALTERNATIVE MATERIALS FOR LINER AND COVER

In recent years, geo membrane and geo synthetic clay liners have been used to improve the performance of liner. But these liners are vulnerable to accidental puncture and create a potential problem with interface shear between their surfaces. Hence composite clay liners are preferred.

The different alternative possible materials are compacted ball clay, limestone slabs, vitrified ceramic tiles, and compressed ball clay blocks.

METHODOLOGY

A. Sample collection

Sample of Dwaraka Tirumala ball clay occurring near Bhimadolu, West Godavari Dist, A.P, India is collected from M/S Vennar ceramic Industries Ltd., Perikigudem, near Gudiwada Krishna Dist, A.P, India

B. Preparation of granulated ball clay powder

Ball clay ground in pot mill with 40% of water, for 3 minutes and the slurry is transferred into a Galvanized Iron (GI) tray. This slip is dried in a lab oven and the dried flakes are ground. 6% of water is sprinkled on the powder, mixed and made to pass through 20 IS mesh to prepare granulated powder. This powder is tested for bulk density using a density bottle and the results are given in table-1.

C. Preparation of ball clay tiles (green)

Granulated ball clay powder is pressed in a lab scale hydraulic press at a pressure of 100kg/cm^2 to obtain the green tile. These tiles are subjected for testing of flexural strength, dry shrinkage, bulk density and the results are given in table – 2.

D. Testing of vitrified ceramic tiles

Samples of vitrified tiles of 300x300x10mm are collected from the market and subjected to testing of flexural strength, water absorption, chemical resistance in accordance with IS 15622. The results are tabulated and presented in table – 3. Further it is tested for reactivity with lechate by keeping it in solid waste for 2 months and comparing with fresh sample.

E. Testing of Lime Stone

Lime stone is kept in solid waste for 2 months in order to test its reactivity with the lechate. The lime stone slab is tested for flexural strength and water absorption. Test results are given in the table-4.

PROPOSED DESIGN OF LINER

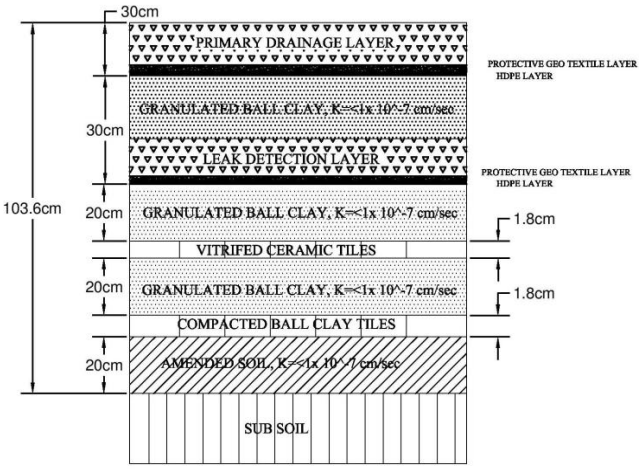
Based on the study of various liners of existing landfill design is found to have an overall thickness is about 150cm.

A. Lining of Base and Sides

Over the sub soil amended soil is placed and compacted of thickness 20cm at a permeability of 1x10^{-7}cm/sec over that compacted ball clay blocks are placed of thickness 2cm after that granulated ball clay powder of thickness 20cm is placed then ball clay powder is compacted. Vitrified ceramic tiles are arranged above the compacted granulated ball clay powder of thickness 1.8cm over that granulated ball clay powder is placed and compacted to the thickness of 20cm and geo membrane is provided on it.

Secondary Leachate collection layer of thickness 30cm is provided. A secondary composite liner comprising of HDPE geo membrane of thick 0.15cm is provided above the drainage layer granulated ball clay is placed to the compacted thickness of 20cm.

Primary a Leachate collection layer of thickness 30cm is placed. A primary composite liner comprising of a HDPE geo membrane of thick 0.15cm is provided. Hereby considering the thickness of each layer the overall thickness for the proposed liner will be 103cm.



Liner design fig.1

B. Cover System

Above the solid waste operational (transitional) layer of 30cm thick is placed a compacted amended soil of 40cm thick is laid above it. HDPE geo membrane of 0.15cm thick is placed beneath the drainage layer of 30cm. The top of the cover is enclosed with a vegetative layer of 60cm. Granulated spray powder of ball clay is placed as a daily cover over the cover system. So that gasses that produced in the landfill may not escape

This design can be used for both hazardous and municipal solid waste purpose.

RESULTS AND DISCUSSIONS

A. Granulated ball clay powder

Table-1

S.no	Parameter	Results
1	Sieve size	
	20mesh	0.2-0.8% retained
	44mesh	3.4-6.8% retained
	52mesh	8.8-12.9%retained
	60mesh	18.2-39.6%retained
	80mesh	29.6-32.4%retained
	120mesh	3.2-9.1% retained
	-120 mesh	-0.5% retained
2	bulk density	992 gm/lit

B. Compressed Ball Clay Tile (green)

Table-2

S.no	Parameter	Results
1	Thickness	9.6mm
2	Flexural Strength	6.9kg/cm2
3	Bulk Density	1.89g/cc
4	Dry Shrinkage	1.02%
5	Moisture Content	5.00%
6	Porosity	< 0.5%

Compressed Ball Clay Blocks fig.2

Hydraulic press fig.3

C. Vitrified Ceramic Tile

Table-3

S.no	Parameter	Results
1	Flexural Strength	462.4kg/cm2
2	Water Absorption	0.01%
3	Size	50x100mm
4	Chemical Resistance	Cannot resist HF acid
5	Thermal Expansion	7x10-6 cm

D. Lime Stone Slab

Table-4

S.no	Parameter	Results
1	Water Absorption	5.80%
2	Flexural Strength	268kg/cm2

CONCLUSION

As the experimental results shows that porosity values for compacted ball clay tile is < 0.5% and porosity for ceramic tile is 0.01% the porosity value is less when compared to the compacted clay. As the porosity is less permeability is also less. Hence the penetration of lechate into overlaying layers can be controlled.

From the proposed design it is clearly shown that the thickness of the entire lining system is reduced by 40-50cm thickness. So that more amount of waste can be accommodated in the landfills when compared to the existing landfills

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A Pragmatic Proposal for Award of Credits to Qualify as a Green Building in Developing Country

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Abstract—
Over the years there has been significant increase in the standard of living of the people around the globe due to rapid industrialization, and urbanization. However, these developments have also resulted in exploitation and overuse of natural resources, which are now hitting us back in the form of global warming, natural calamities and other tantamount effects. The word is slowly getting spread that we need to protect the environment so the quality of life for us and future generations does not deteriorate. To protect our Environment, the concept of Green Building has come in to picture which helps to reduce the pollution that is being produced from industries, automobiles, houses, pesticides, etc. However, lack of awareness on this technology, coupled with improper city planning, and complacency to provide support at the level of Government and local bodies has challenged for astute implementation of green technology. A Green Building is a sustainable building which is environmentally eco-friendly and resource efficient. Developed countries like USA, UK kick started to make people aware about this technology and provide aid for implementation through organizations like USGBC (United State Green Building Council), LEED (Leadership in Energy and Environment Design) and NAHB (National Authority of High Rise Buildings). In India, too, the task has been taken up through IGBC(Indian Green Building Council). The main aim of the Council is to reduce the pollution that emanates from houses and industries and seek for alternative renewable resources of energy for efficient use of building materials.

In this research the process of point system for award of IGBC credits has been studied in detail and it was observed that the system is too complex for adoption for low and middle income group of houses in developing country environments like India and Nepal. Thus there is a need to review and suggest an encouraging system of categorizing the houses as Green Houses in developing country environment. In this research different factors like area, type of design, materials used have been included to come up with new plans and assignments of credits in a way that they can be achieved relatively easily. Also components like landscape, parking facilities, energy performance, grey water management, management of irrigation systems, credits have also been factored in so that certification as green building is made easy for new and existing low and middle income groups/class of houses to promote sustainable development in the near future

Index Terms— Green Buildings, Environment, Accessible Credits, LEED and IGBC, Human Health, Sustainable Development

INTRODUCTION

Air, water, forests, and land are the main component of environment. All these components are polluted by human beings through misuse and overuse of these natural resources. Due to this many affects such as air pollution, water pollution, depletion of forests, soil erosion etc are seen which has made adverse effect in different components of environment. This is the reason why un-expected rain falls, cyclones, floods, sudden increase in temperature, earth quakes, polluted water, polluted air, decreased growth of trees are commonly occurring and are seen by all of us in our everyday life. Cutting of trees is also affecting the quality of air. Humans can live without water for some days but can't live without trees which enrich us with Oxygen even for a few minutes. Human beings have lately realized that if the environment is safe then they can live safely and healthy, which ultimately lead them for finding the solutions for protecting the environment by controlling the pollution with new ideas.

Though the environmental protection concept was started in 1970 it came into progress in the form of Green revolution in 1990 which raised the attention for the need for preservation of environment [19]. [1] Many developed countries like USA & UK have already started Green building concept i.e. the building that beneficially utilize renewable sources like solar energy, wind energy and water from rain water harvesting, recycling grey water etc.[20] and enhance energy efficiency by innovative design, materials that we use in the building. Developing countries like India, Nepal, and Sri Lanka have started with Green Building Council(s) that include all the specifications that are required for the Green Building like soil parameters, energy parameters, day light and ventilation parameters, innovative design etc.Right now many developed and developing countries like USA, UK, India, Nepal, Bhutan, Sri Lanka, Japan, New Zealand etc. have instituted councilsknown as: USGBC, UKBC,IGBC, NGBC,BGBC, SGBC, JGBC, NGBC etc. for the preserving the environment. It is widely understood that five parameters e.g. water use, energy consumption, type of material, site selection and planning and innovative design play important role in deciding whether a building can be rated as a green building or not.

ONGOING TRENDS AND ITS IMPLEMENTATION EFFECTIVENESS:

Nowadays a green building is becoming most popular due to its effective energy conservation and eco-friendliness to the environment. The process of construction of a green building is same as construction of a normal building but the ideology is different from one another[21].The green building concept was introduced by the United States Green Building Council (USGBC). This USGBC has developed leadership in energy and environmental design (LEED) for major construction and remodeling projects [2]. LEED gives the certification for Green building and also enumerates the steps to be followed during construction. However, LEEDS certification is mostly applicable for the major constructions like multistoried buildings, commercial buildings and remodeling buildings [3].

LEED has identified 18 criteria for the certification as a green building. Each building is assessed and points are awarded based on which a building is certified as being silver, gold, or platinum rated building[22].

IGBC and other Green Building Councils have developed their own rating system.Since ultimate aim of all the green building rating systems (USGBC, LEED, NAHB, IGBC, TERI, MNRE, IBEE, CII, and IPD) is to protect the environment from the pollution that comes from the residential buildings and industries by reducing the utilization of non-renewable sources like coal, crude oil etc., and increase the utilization of natural resources like solar energy, wind energy and renewable resources which can be reused like recyclable products which are eco-friendly to environment[14].There are different organizations which are responsible for spreading the green concept worldwide like US Green Building Council (USGBC), which is a third party certification body, Bureau of Energy Efficiency (BEE), Indian Green Building Council and several other non-profitable government organizations[23]. Literature released through these organizations also confirms that green buildings are proven to be environmental friendly and result in reducing consumption of natural resources, pollution and waste and also improves the health of people [4]. Energy consumed by heating; ventilation and air conditioning (HVAC) and lighting systems utilize 60% of the electric power of the buildings, which challenges the green concept[15]. The level of utilization of such material need to be reduced and alternatives sought. These could simply be achieved by the use of photovoltaic solar cells [5] or reducing the consumption of lights through day lighting effects [6].

Different organizations also charge fee for award of green building certification. Figure 1 below shows about the registration charges of different countries. It should be emphasized that high registration charge often proves to be deterrent for people to go in for green building technology, as depicted in figure 2 below.

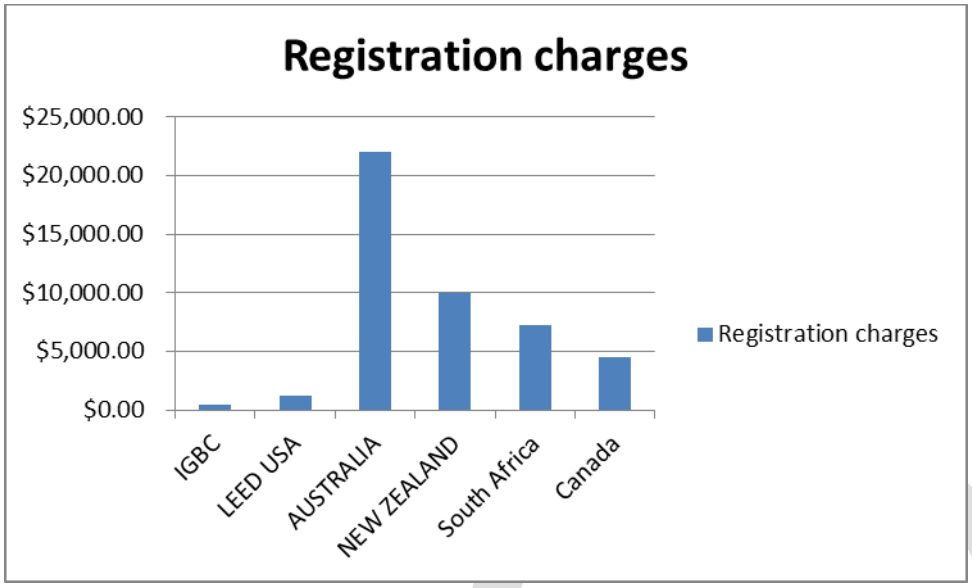

Fig-1 Comparison of Registration Charges among different Countries [7][8][9][10][11][12]

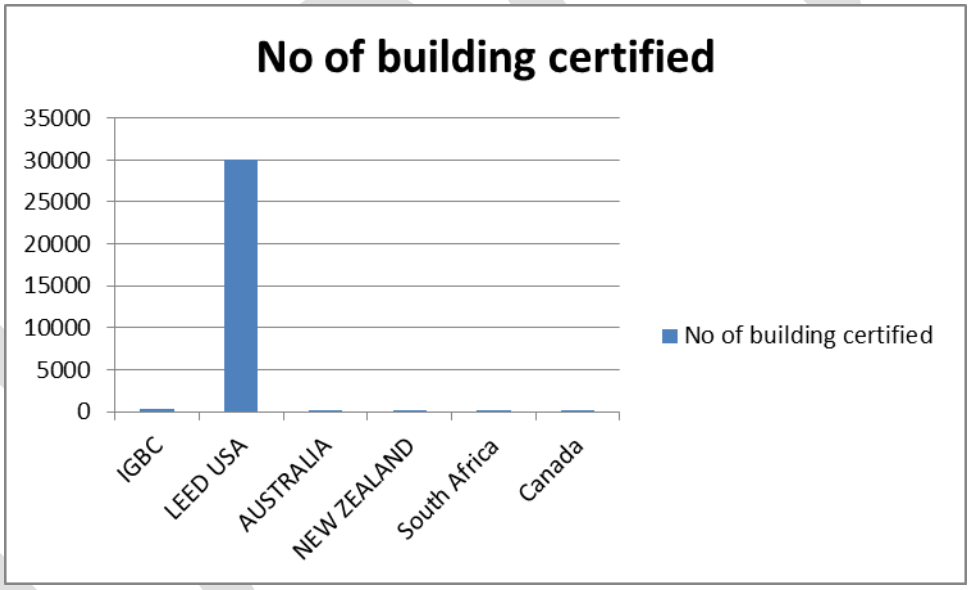

Fig - 2 Comparison of certified buildings among different Countries

The above figure shows the no of buildings that are certified as Green Buildings in Different Countries. This shows that awareness in the people and Government implementation is the main drawback in implementing the Green Building concept even in the developed world.

Table 1 below shows the IGBC credit criteria being currently used for awarding points for building to be branded as being green building or not [7].

IGBC Credits		Points available	
		Projects with interiors	Projects without interiors
Site selection and planning			
Mandatory requirement 1	Local regulations	Required	Required
Mandatory requirement 2	Soil erosion	Required	Required
Site credit 1.0	Basic Amenities	1	1
Site credit 2.0	Natural topography or landscape:15%,25%	2	2
Site credit 3.0	Heat Island effect-Roof:50%,70%	2	2
Site credit 4.0	Parking facilities for visitors	1	1
Site credit 5.0	Electric charging facility for vehicles	1	1
Site credit 6.0	Design for differently abled	1	1
Site credit 7.0	Green home guidelines-Design & post Occupancy	NA	1
		8	9
Water Efficiency			
Mandatory requirement 1	Rainwater harvesting,50%	Required	Required
Mandatory requirement 2	Water efficient fixtures	Required	Required
Water credit1.0	Turf Design: 20%,40%	2	2
Water credit2.0	Drought tolerant species: 25%	1	1
Water credit3.0	Management of irrigation systems	2	2
Water credit4.0	Rainwater harvesting; 75%,95%	2	2
Water credit5.0	Grey water treatment:50%,75%,95%	3	3
Water credit6.0	Treated grey water for landscaping: 50%,75%,95%	3	3
Water credit7.0	Treated grey water for flushing: 50%,75%,95%	3	3
Water credit8.0	Water efficient fixtures:20%,30%	3	3
Water credit9.0	Water metering	1	1
		20	20
Energy efficiency			
Mandatory requirement 1	CFC free Equipment	Required	Required
Mandatory requirement 2	Minimum energy performance	Required	Required
Energy Credit 1.0	Energy performance	10	10
Energy Credit 2.0	Energy metering	1	1
Energy Credit 3.0	refrigerators	1	NA
Energy Credit 4.0	Solar water heating systems: 50%.75%,95%	3	3
Energy Credit 5.0	Captive power generation	1	1
Energy Credit 6.0	On-site renewable energy: 2.5%,5%,7.5%,10%	4	4
Energy Credit 7.0	Efficient luminaries & lighting power density:20%	1	1
Energy Credit 8.0	Energy saving measures in other appliances & equipment	1	1

		22	21
Materials			
Mandatory requirement 1	Separation of waste	Required	Required
Material credit 1.0	Waste deduction during construction: 75%	1	1
Material credit 2.0	Organic waste management, Post occupancy: 50%, 95%	2	2
Material credit 3.0	Material with recycled content:10%,20%	2	2
Material credit 4.0	Rapidly renewable materials: 2.5%,5%	2	1
Material credit 5.0	Local materials: 50%,75%	2	2
Material credit 6.0	Reuse of salvaged materials: 2.5%,5%	2	2
Material credit 7.0	Certified wood based materials and furniture: 50%, 75%	2	2
		13	12
Indoor environmental quality			
Mandatory requirement 1	Tobacco smoke control	Required	Required
Mandatory requirement 2	Day lightning: 50%	Required	Required
Mandatory requirement 3	Fresh air ventilation	Required	Required
IEQ Credit 1.0	Exhaust systems	2	NA
IEQ Credit 2.0	Enhanced fresh air ventilation: 30%	2	2
IEQ Credit 3.0	Low VOC materials	2	2
IEQ Credit 4.0	Carpets:5%	1	NA
IEQ Credit 5.0	Building flush out	1	NA
IEQ Credit 6.0	Day lightning :75%,85%, 95%	3	3
IEQ Credit 7.0	Cross ventilation	2	2
		13	9
Innovation and Design Process			
INN Credit 1.1	Innovation and Design Process	1	1
INN Credit 1.2	Innovation and Design Process	1	1
INN Credit 1.3	Innovation and Design Process	1	1
INN Credit 2.0	IGBC AP	1	1
		4	4
		80	75

Table-1 IGBC Credits for the certification of Green Building

LOCAL REGULATIONS:

This requirement can be achieved by every person irrespective of whether he/she belongs to low class, middle class and high class. But still low class and middle class people are lagging in this requirement due to reasons like:

- Awareness about the local regulations, many people don't realize the benefits of living in healthy environment, in house or outside.
- Municipality rules, implementation procedures and city planning are not clear enough to common masses, thereby providing no encouragement to potential users.

SOIL EROSION:

Soil Erosion is one of the parameters of consideration for the Green Building. The top soil on the empty site is most important that contains many important nutrients that cannot be achieved easily. This soil may be transported where ever it is required for cultivation

etc. due to soil erosion and improper settlements the building may sink. This requirement can be met by every class of people but due to lack of awareness about the importance soil and its properties the implementation is lagging.

BASIC AMENITIES*:*

At least 5 of the following basic amenities like school, college, police station, hospital, post office, retail shops, bank, temple, restaurant, electrician, laundry etc. should be nearby their house with a maximum distance of 1 Km. While in most cases this can be achieved by all groups of houses,sometimes it cannot be achieved due to improper city planning.

NATURAL TOPOGRAPHY AND PARKING FACILITIES:

This can be achieved only when large areas of land are available. This requirement can be achieved only by high class people and apartments for low class and middle class people cannot achieve this requirement.

RAIN WATER HARVESTING:

This is the requirement which any type of house can implement very easily and can achieve this requirement. But to achieve this to 100% usage we should motivate the uneducated people and educate them about the advantages of rain water harvesting and its uses.

GREY WATER TREATMENT ANDITS USAGE*:*

This can be implemented only in large houses where the land area is more so, low class people and middle class people can't achieve this requirement.

Low class and middle class people can achieve this by a scientific technique where this water can be passed through the trees and sand filter and later on it can be used for flushing purpose.

ENERGY PERFORMANCE:

Energy performance such as renewable energy (solar, wind energy) and other energy efficient appliances and should be used and implemented. Scientists say that after 2050 there will be no energy from non-renewable Sources (coal, gas). So use of alternative energy i.e., renewable energy should be encouraged. So government should provide the devices working on renewable energy sources with some subsidy to low income people.

MATERIALS:

Material selection is the crucial part that influences our health and the environment indirectly. It affects the human in the form of gases and to environment in the form of time of decomposition in to the soil. So, everyone should know about the type of materials and their uses and disadvantages.

INDOOR ENVIRONMENTAL QUALITY:

The design of the house should encourage cross ventilation so that people who live in house can get fresh air and day light. Ventilation shall also drive away unwanted gases that are released by paints and other materials. This can be achieved by innovative design practices [18].

INNOVATIVE DESIGN:

This is the design where all the important parameters such as local Regulation, Soil Erosion, Water Efficiency, Energy Efficiency, Material Selection, and Indoor Environmental Quality are included in a building. If we design building based on innovative design principles then every house can be a green building.

DRAWBACKS OF THE IGBC CREDITS FOR IMPLEMENTATION*:*

- The parameters like local regulations, Soil Erosion, Basic Amenities, Rainwater Harvesting, Water Efficient Fixtures, Turf Design, Waste Deduction during Construction, Local Materials, Day Lightning, Fresh Air Ventilation, Low VOC Materials, Cross Ventilation, Innovation and Design Process etc. can be acquired by every class of people but low class people and middle class people cannot implement due to lack of awareness about their advantages.
- The parameters such as Natural Topography, Parking Facilities, Management of Irrigation Systems, Grey Water Treatment, Energy Performance, Solar Water Heating System, Captive Power Generation, Onsite Renewable Energy, Organic Waste Management, Carpets that are in the IGBC table cannot be acquired by the common people because they are very costly and also these are difficult to be implemented in houses of smaller areas.
- Awareness is one of the major drawbacks that is impeding the implementation of Green Building/Green Industries [16].
- Cost is another drawback where people are not showing interest to go for the Green Building. The minimum registration and certification fee is Rs 250000/- form very small independent house to medium independent house. Again they have to register the house in the municipality and pay the normal registration charges again. This is the reason why people are not going for Green Building.
- Lack of improper city planning.
- Awareness about the environment and their impacts that are being produced from industries and houses is lacking in all low and middle class people [17].

DISCUSSION

- We should bring awareness to all the low class and middle class people by conducting awareness programs wherein emphasis need to be given to educate about Green Building and its advantages and Environment protection.
- Green building course should be made mandatory at the school level. Training to children should be provided through small workshops and seminars.
- By considering the low class people and middle class people conditions like type of house, annual income and their requirements, it is suggested that special IGBC crediting system as shown in Table 2 below should be used for all the low class and middle class houses and by this we can make every house as a Green Building.
- For poor and middle class people who can't afford high technology there must be a provision made for providing free consultancy service for Green Building Designs and education.
- Government should help the poor people by giving bank loans, subsidies etc.

IGBC Credits		Points available	
		Projects with interiors	Projects without interiors
Site selection and planning			
Mandatory requirement 1	Local regulations	2	2
Mandatory requirement 2	Soil erosion	2	2
Site credit 1.0	Basic Amenities	1	1
Site credit 2.0	Natural topography or landscape:15%,25%	Optional	Optional
Site credit 3.0	Heat Island effect-Roof:50%,70%	1	1
Site credit 4.0	Parking facilities for visitors	Optional	Optional
Site credit 5.0	Electric charging facility for vehicles	1	1
Site credit 6.0	Design for differently abled	1	1
Site credit 7.0	Green home guidelines-Design & post Occupancy	NA	1
		8	9
Water Efficiency			
Mandatory requirement 1	Rainwater harvesting,50%	4	4
Mandatory requirement 2	Water efficient fixtures	2	2
Water credit1.0	Turf Design: 20%,40%	2	2

Water credit2.0	Drought tolerant species: 25%	2	2
Water credit3.0	Management of irrigation systems	Optional	Optional
Water credit4.0	Rainwater harvesting; 75%,95%	3	3
Water credit5.0	Grey water treatment:50%,75%,95%	2	2
Water credit6.0	Treated grey water for landscaping: 50%,75%,95%	1	1
Water credit7.0	Treated grey water for flushing: 50%,75%,95%	1	1
Water credit8.0	Water efficient fixtures:20%,30%	2	2
Water credit9.0	Water metering	1	1
		20	20
Energy efficiency			
Mandatory requirement 1	CFC free Equipment	1	1
Mandatory requirement 2	Minimum energy performance	1	1
Energy Credit 1.0	Energy performance	10	10
Energy Credit 2.0	Energy metering	1	1
Energy Credit 3.0	refrigerators	1	NA
Energy Credit 4.0	Solar water heating systems: 50%.75%,95%	1	1
Energy Credit 5.0	Captive power generation	1	1
Energy Credit 6.0	On-site renewable energy: 2.5%,5%,7.5%,10%	4	4
Energy Credit 7.0	Efficient luminaries & lighting power density:20%	1	1
Energy Credit 8.0	Energy saving measures in other appliances & equipment	1	1
		22	21
Materials			
Mandatory requirement 1	Separation of waste	2	2
Material credit 1.0	Waste deduction during construction: 75%	2	2
Material credit 2.0	Organic waste management, Post occupancy: 50%, 95%	Optional	Optional
Material credit 3.0	Material with recycled content:10%,20%	2	2
Material credit 4.0	Rapidly renewable materials: 2.5%,5%	2	1
Material credit 5.0	Local materials: 50%,75%	2	2
Material credit 6.0	Reuse of salvaged materials: 2.5%,5%	2	2
Material credit 7.0	Certified wood based materials and furniture: 50%, 75%	1	1
		13	12
Indoor environmental quality			
Mandatory requirement 1	Tobacco smoke control	1	1
Mandatory requirement 2	Day lightning: 50%	1	1
Mandatory requirement 3	Fresh air ventilation	1	1
IEQ Credit 1.0	Exhaust systems	1	NA
IEQ Credit 2.0	Enhanced fresh air ventilation: 30%	1	1
IEQ Credit 3.0	Low VOC materials	2	2
IEQ Credit 4.0	Carpets:5%	Optional	NA
IEQ Credit 5.0	Building flush out	1	NA
IEQ Credit 6.0	Day lightning :75%,85%, 95%	3	3
IEQ Credit 7.0	Cross ventilation	2	2

		13	11
Innovation and Design Process			
INN Credit 1.1	Innovation and Design Process	1	1
INN Credit 1.2	Innovation and Design Process	1	1
INN Credit 1.3	Innovation and Design Process	1	1
INN Credit 2.0	IGBC AP	1	1
		4	4
		80	75

Table-2 IGBC Credit System for low and middle class Houses

CONCLUSIONS

Community awareness programs should be conducted to educate people about the resources and energy and the need and advantages of using green building concept. All the polluting industries shouldbe encouraged to implement green concept to reduce the pollution to save the environment.. Government should encourage implementation of Green Building concept by providing opportunity for subsidies and/or free consultation. Government and Banks should help the poor and middle class people by giving loans and subsidies as they can't afford the high technology due to cost factors. This approach can be spread by updating the green concept course from the primary school level itself. Various program, conference and training workshops must be launched on a regular basis. Green building is a boon to the society where energy and water consumption can be reduced. It also results in enhanced productivityand better health and safety conditions for occupants.

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