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Use of Construction Management Techniques for Economic Feasibility through Cost and Time Analysis a Case of Wakan Pali Khopoli Sections of NH548A

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ABSTRACT: Because of the growing number of environmental issues, good management has become a necessity on both an environmental and economic level. Because the development of a management system is associated with significant investment and operational costs, it is critical to assess economic considerations.

The Economic Evaluation was carried out using a cost structure to analyze the management scenarios from a financial standpoint.

A benefit–cost analysis was used to assess the economic feasibility of minimization wastage and strategies such as reusing and recycling material. The study demonstrates that minimization is both economically possible and beneficial to environmental management, as it addresses construction creation and composition, as well as reuse and recycling on the job site.

Construction costs are included in the overall costs of developing a developed asset, such as a highway. Construction cost is one of the most important factors in determining a project's performance throughout its lifecycle, and it is of great concern to individuals in the construction business. It is feasible to speak about a new path in the evolution of construction pricing by shaping the methodological basis of professional cost management.

I. INTRODUCTION

General Introduction What is Cost?

Expense incurred by a contractor for labour, material, equipment, financing, service utilities etc. plus overheads and contractors' profit. Cost of land, architectural design, fee of consultant and engineer are not construction costs.

Types of cost Fixed Costs

❖ **Fixed costs** are those that do not change throughout the life-cycle of a project. For example, if construction of highway is there, the excavators and bulldozers are fixed costs. For software development projects, the physical development space and development computers are fixed costs to the project.

❖ **Direct Costs** Direct costs are expenses that come out of the project budget directly. For example, if outsourcing some of the development work, the developers are expected to put in a specific amount of time, which is then billed for. The developer salaries are direct costs.

❖ **Sunk Costs** Sunk costs are those that have been incurred in a project, but have not produced value towards the project's objectives.

II. FACTORS AFFECTING CONSTRUCTION COST

There are many factors which affect the construction cost estimate and have significant impact on project cost and they are as following:

❖ **Similar Construction Projects:** For the construction estimate, the best reference will be similar construction projects. The final cost of those similar projects can give the idea for the new construction project cost calculation. The final cost of past project needs to be factored with current construction cost indices.

❖ **Construction Material Costs:** Construction material cost consists of material cost, shipping charges and taxes



applicable if any. So, it is important consider all these variations while calculating construction material cost.

❖ **Labor Wage Rates:** Labor wages varies place to place. So, local wage rate should be considered in calculation. If the project has to be started after several months of estimating the project cost, the probable variation in wage rates has to be considered in the calculation.

❖ **Construction Site Conditions:** Project site conditions can increase construction costs. Site conditions such as poor soil conditions, wetlands, contaminated materials, conflicting utilities (buried pipe, cables, overhead lines, etc.), environmentally sensitive area, ground water, river or stream crossings, heavy traffic, buried storage tanks, archaeological sites, endangered species habitat and similar existing conditions etc. can increase the project cost during construction phase if these variations are not considered during estimation.

❖ **Inflation Factor:** A construction project can continue for years before completion. During the construction period, the cost of materials, tools, labors, equipment etc. may vary from time to time. This variation in the prices should be considered during cost estimation process.

❖ **Project Schedule:** Duration of construction project is affects the cost. Increase in project duration can increase the construction project cost due to increase in indirect costs, while reduction in construction cost also increases the project cost due to increase in direct costs. Therefore, construction project schedules also need to be considered during project cost estimation.

❖ **Quality of Plans & Specifications:** A good quality construction plans and specifications reduce the construction time by proper execution at site without delay. Any vague wording or poorly drawn plan not only causes confusion, but places doubt in the contractor's mind which generally results in a higher construction cost.

❖ **Insurance Requirements:** Cost estimation for construction projects should also need to consider costs of insurance for various tools, equipment, construction workers etc. General insurance requirements, such as performance bond, payment bond and contractors general liability are normal costs of construction projects. In some special projects, there can be additional requirements which may have additional costs.

❖ **Size and Type of Construction Project:** For a large construction project, there can be high demand for workforce. For such a requirement, local workmen may not be sufficient and workmen from different regions need be called. These may incur extra costs such projects and also for the type of construction project where specialized workforce is required.

❖ **Location of Construction:** When a location of construction project is far away from available resources, it increases the project cost. Cost of transportation for workmen, equipment, materials, tools etc. increases with distance and adds to the project cost.

❖ **Engineering Review:** Sometimes it is necessary to carry out technical review of construction project to make sure the project will serve the required purpose with optimum operational and maintenance cost. This review cost shall also be added to the project cost.

❖ **Contingency:** It is always advisable to add at least 10% contingency towards the total project costs for unforeseen costs and inflation

III. HISTORY

The modern system of construction pricing includes not only the budget development at the design stage but also determination of the construction products cost at other stages of the investment and construction process. The current pricing system in construction no longer meets the needs of the participants of investment and construction (primarily the needs of the state as the main participant in the efficient budget investment). Fundamental changes in approaches to the whole system of formation and management of construction costs are necessary. In this regard, the improvement of the construction pricing should be implemented through the transition to a new system of construction cost management (cost engineering in construction) that would combine the preliminary assessment of the investment costs, the estimated pricing, contract pricing, the system of the actual costs determination, and allow connecting and managing the aforementioned processes. Construction cost management provides for interconnection of the investment and construction process stages, and transitions from one kind of cost to the other from investment to estimated, from estimated to contract, from contract to actual, from actual to operation cost (with regard to reconstruction, capital and current repairs) and the investment cost of such facilities planned for implementation in the future.

Cost-benefit Analysis An economic feasibility of a project can be assessed using cost-benefit analysis with the help of benefit-cost ratio. Benefit-cost ratio is the ratio of the benefits of a proposal or project, expressed in monetary terms, relative to its costs, also expressed in monetary terms. If the value of the benefit-cost ratio is more than one, then the project is economically feasible.



Construction Industry plays a key role in the process of economic transformation and growth. Export of projects and services indicate a country's progress in technology and export performance. Most of the companies are versed only with engineering and technology. The decision to bid is a major financial decision because of two reasons. First, the contractor assumes substantial costs for the preparations of the estimates and the tender at the risk of not recovering them if he is not awarded the job. Second, and most importantly, the contractor commits himself to investment in the construction of the project

Problem Statement

Project is a unique process, consist of a set of coordinated and controlled activities with start and finish dates, undertaken to achieve an objective conforming to specific requirements, including the constraints of time cost and resource This study aims recognition and Interpretation of traffic accident system analysis on highway accidents using blooms Technology through mathematical Model.

Need For Construction

To improve the accessibility of a peripheral area, the construction of new modernizations of the existing network is not objectives, butthe means through which the objective of improving the area's accessibility will be accomplished.

Project over-scaling investments which are functionally independent of each other are packaged together without a preliminary verification of the economic viability of each investment and of possible combinations

Project under-scaling a request for assistance is presented for financing a portion of a project which cannot be justified in isolation from other functional elements.

a project are included in the economic analysis of the first phase without also including the additional costs, thus making the first phase look economically and/or financially more attractive.

To minimize energy costs / waste without affecting production & quality and to minimize environmental effects and to identify the source of wastes (classified under lean construction) for specifically chosen activities at a construction site and relate them to identified in construction industry.

To increase project productivity improvements by reducing and eliminating the classified under lean construction; to identify the problems in processing of heavy equipment on site and find out the best solution for the efficient work by reducing the cycle time for more output and to find out the critical situations on site and how to overcome those immediately to increase the productivity in construction based on cost effective

Aims And Objectives

➤ The main objective of our thesis work to measure the resource productivity of a National Highway project; finding out the factors affecting the productivity of the resources; establishing interrelations of the factors and finally formulation of a system to estimate the productivity of the resources in different environmental and site conditions.

➤ a project are included in the economic analysis of the firstphase without also including the additional costs, thus making the first phase look economically and/or financially more attractive.

➤ To minimize energy costs / waste without affecting production & quality and to minimize environmental effects and to identifythe source of wastes.

➤ To identify the problems in processing of heavy equipment on site and find out the best solution for the efficient work by reducing the cycle time for more output and to find out the critical situations on site and how to overcome those immediately to increase the productivity in construction based on cost effective.

➤ To find different resources of waste generated on site and use them to decreased project cost to optimize project cost

IV. LITERATURE REVIEW

Since construction costs are incurred over the entire construction phase of a project, it is often necessary to determine the amounts to be spent in various periods to derive the cash flow profile, especially for large projects with long durations. Consequently, it is important to examine the percentage of work expected to be completed at various time periods to which the costs would be charged.

Consider the basic problem in determining the percentage of work completed during construction. One common method of estimating percentage of completion is based on the amount of money spent relative to the total amount budgeted for the entire project. This method has the obvious drawback in assuming that the amount of money spent has been used efficiently for production. A more reliable method is based on the concept of value of work completed which is defined as the product of the budgeted labor hours per unit of production and the actual number of production units completed, and is expressed in budgeted labor hours for the work completed. Then, the percentage of completion



at any stage is the ratio of the value of work completed to date and the value of work to be completed for the entire project. Regardless of the method of measurement, it is informative to understand the trend of work progress during construction for evaluation and control.

An Alternative Method for Traffic Accident Severity Prediction: Using Deep Forests Algorithm Jing Gan , Linheng Li , Dapeng Zhang , Ziwei Yi , and Qiaojun Xiang, Journal of Advanced Transportation, 21 December 2020

To verify the superiority of our proposed method, several other machine learning algorithm-based prediction models were implemented to predict traffic accident severity with the same dataset, and the prediction results show that the Deep Forests algorithm present good stability, fewer hyper-parameters, and the highest accuracy under different level of training data volume. It is expected that the findings from this study would be helpful for the establishment or improvement of effective traffic safety system within a sustainable transportation system, which is of great significance for helping government managers to establish timely proactive strategies in traffic accident prevention and effectively improve road traffic safety.

Integrating Accident and Travel Delay Externalities in an Urban Speed Reduction Context David A. Hensher, Transport Reviews: A Transnational Trans-disciplinary Journal, November 2014

The paper takes a close look at the empirical relationship between accident and travel delay externalities in an urban setting, accounting for the risk-compensating behaviour under conditions of greater accident risk. Recognizing that levels of risk in an urban setting are broadly a function of traffic densities and that the latter can be approximated by the mix of free flow and non-free flow travel time (for a given total travel time), an aggregate marginal externality cost function is used to quantify empirically the input elements in the context of a driver's choice between a free and a tolled route.

Sindhu Vaardini, "Study on Cost Overruns in Construction Projects", International Journal of Applied Engineering Research, (2016),

Cost overrun is considered as one of the most important problems that encumber projects progress, since it reduces the contractor's profit leading to enormous losses, and leaving the project in great troubles. Construction cost is one of the peak criteria of success of a project throughout its lifecycle and is of high concern to those who are involved in the construction industry. All projects, regardless of size, complexity are saddled by targets and uncertainty. Mostly in developing countries construction projects are characterized by overruns in cost. Cost overruns occur in every construction project and the magnitude varies significantly from project to project. This leads to severe need of addressing the acute issue of construction cost overrun. This paper describes the state of art of the research on cost overrun factors in the construction projects. From the reviews, an attempt is made to cultivate a robust and practical schema for interpreting the overrun in project cost based on the factors.

Investigation of accuracy of pavement mechanistic empirical prediction performance by incorporating Level 1 inputs Md Mehedi Hasan, A.S.M. Asifur Rahman, Rafiqul A. Tarefder, Journal of Traffic & Transportation Engineering, & Science Direct 18 May 2019

The main goal of this study is to characterize the pavement materials to produce Level 1 inputs for the M-E analysis as well as investigate the accuracy of performance prediction for pavements in New Mexico. The predicted distress quantities for international roughness index (IRI) and rutting were compared with the field collected data as well as among the three design levels. The analysis results demonstrated that M-E over predicts IRI and rutting in the pavement compared to the field performance. It was also observed that Level 1 showed the lowest rutting, whereas the maximum rutting was found at Level.

Shabniya V, "Factors Affecting Construction Cost Estimation of Highway Projects", Construction industry could be considered as a very important sector for development all over the World and the construction cost estimation is the most important element in it. Realistic estimation of construction cost is vital for both successful planning and completion of every construction project. The key factor in a project's success is the accurate cost estimation at its early stage. It is difficult to quickly and accurately estimate construction costs at the planning stage itself when project information is limited. This study was carried out to identify the factors affecting construction cost estimation. The factors were identified based on questionnaire survey. Questionnaires were given to 64 experts in the construction industry to determine the importance of construction cost estimation and to determine the score of each factor.



Statistical analysis was carried out on the feedback of the respondents of the survey. RII value of the factors was found using Microsoft Excel. The mean score of each factor was determined and the p-value was calculated using the SPSS software. The significance of each factor used in the questionnaire was determined. The significant factors were identified using the mean score and their p value.

Zhen Leng, AnandSreeram, Rabindra Kumar Padhan, Zhifei Tan, Value-added application of Concrete PET based additives in bituminous mixtures containing high percentage of reclaimed asphalt pavement (RAP), Journal of Cleaner Production, 196 (2018) 615-625.

This study investigates the use of reclaimed asphalt pavement (RAP) in road pavement construction has been widely encouraged due to its environmental and economic benefits. This research has shown that the addition of Concrete Admixtures materials such as Polyethylene Terephthalate (PET) or their functionalized additives into asphalt pavement may potentially improve the durability of pavement and also help alleviate the environmental problems caused by Admixtures. In this study, chemically synthesized PET additive was shown to be suitable to be incorporated in asphalt binders containing RAP providing better performance to conventional virgin binder. A limitation of this study was that only binder tests were carried out, therefore upcoming research will be focused on conducting mixture studies to ascertain the viability for field tests. In Addition, the RAP used was of moderate ageing level. Future tests should also be conducted using various RAP sources to ascertain and quantify the rejuvenating capability of PET additives.

Dharamveer Singh, Shashi bhushan Girimath, Toward Utilization of ground tire rubber and reclaimed pavement materials with asphalt Binder: Performance evaluation using essential work of fracture, International Journal of Pavement Research and Technology, 11 (2018) 594–602.

This study discusses utilization of ground tire rubber (GTR) binder in combination with reclaimed asphalt pavements (RAP) binder can provide added benefits in terms of material, cost and environmental saving, and hence a promising step toward sustainable construction of pavements.

M.A. Lyubarskaya, V.S. Merkusheva, P.A. Osian, A. A. Ilin, E.S. Svintsov, Integrated Approach To Using Technology Of Reclaimed Asphalt Pavement (RAP), Procedia Engineering, 189 (2017) 860 – 866 .

The article analyses the problems of lack the system approach to using reclaimed asphalt pavement technologies (RAP) in Russia. The purpose of this article is to review global experience with RAP, identify common issues of implementation of this technology and develop methods to ensure a comprehensive approach to the use of RAP in Russia. An integrated approach to the use of the technologies of reclaimed asphalt pavement (RAP) includes a number of action sequences on the justification of contractor's decision making performing road: the choice of the BAT, assess the implications of selected technologies and the choice of road- Highway equipment used for production work.

Valdes-Vidal, A. Calabi- Floody, E. Sanchez-Alonso, Performance evaluation of warm mix asphalt involving natural zeolite and reclaimed asphalt pavement (RAP) for sustainable pavement construction, Construction and Highway Materials, 174 (2018) 576–585.

The paper present an experimental study to characterize the mechanical behaviour of warm mix asphalt (WMA) mixtures designed with Chilean natural zeolite and different amounts of reclaimed asphalt pavement (RAP) for sustainable pavement construction. Five WMA mixtures were evaluated and compared with one reference hot mix asphalt (HMA). Two WMA mixtures were fabricated with 0.3% and 0.6% w/a natural zeolite; and three WMA mixtures were fabricated with 0.6% w/a natural zeolite and 10%, 20% and 30% RAP content. Chilean natural zeolite (clinoptilolite-modernite type) can be used to design WMA mixtures, allowing a decrease of 20°C in manufacturing temperature in relation to HMA conventional mixture, with lower asphalt ageing.

V. METHODOLOGY

Step 1 Defining Baseline and Alternative Projects include an effort to describe the state of the world to which the proposed project will be compared.

Step 2 Determining Whose Benefits and Costs Count requires a determination of who has standing, or the geographic scope over which the benefits and costs will be counted. That is, will costs and benefits be evaluated it.



Step 3: Estimate and Quantify the Impacts of the Project requires the identification of the project's physical impacts, defines them as costs or benefits, and assigns units of measurement. The list of costs and benefits considered depends upon how the project affects the people with standing. In other words, different costs and benefits may be considered depending upon who is determined to have standing.

Step 4: Monetizing Converting each of the costs and benefits to a common unit allows for the direct comparison of costs to benefits



Figure: Methodology chart

Step 5: Discounting Benefits and Costs to Estimate Present Value (PV) adjusts the costs and benefits that occur at various times throughout the project into a single time period so they are directly comparable to one another. This process involves what economists call discounting or calculating a present value.

Step 6: Estimating the Overall Net Present Value (NPV) is equivalent to estimating the net social benefit of the project. This is calculated as the present value of the benefits minus the present value of the costs ($NSB = PV \text{ Benefits} - PV \text{ Costs}$).

Step 7: Incorporating Risk and Uncertainty requires the sensitivity of outcomes to be evaluated

Step 8: Making Recommendations requires consideration of the projects NPV, sensitivity of NPV calculations, and any impacts that could not be quantified and/or monetized.

- Waste identification,
- Source separation and collection; Waste processing;
- Quality management;
- Policy and framework condition



V. DATA COLLECTION & ANALYSIS

Data Collection

In construction project reduction in cost can be achieved by some of the following techniques:

- Value Engineering
- Material Management
- Budgetary Control
- Cost optimization Techniques
- Cost Reduction Techniques at site

a) Value Engineering:

Value engineering is a systematic application of recognized techniques which identify the functions of the product or service, establish the worth of those functions, and provide the necessary functions to meet the required performance at the lowest overall cost. Application of Value Engineering (VE) to construction projects is a solution which emphasizes the function of project which helps to team to make final choice and which results in cost effective design for project.

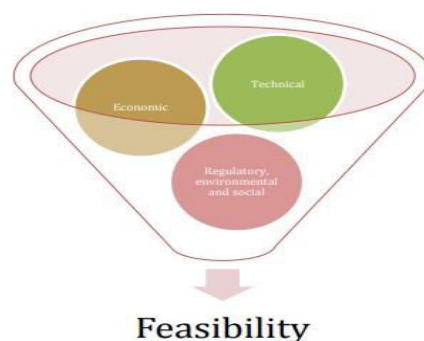
b) Material Management:

To manage productivity and cost efficiency material management is essential. It contributes the major portion of expenses in construction projects. Controlling procurement, carrying cost can reduce total project cost and complete the project in a fast track method. ABC (Always Better Control) is the tool to identify that material. By resource leveling, smoothing usage can be brought to optimum refined level so that much storage cost can be eliminated. Economic Order Quantity (EOQ) is arrived, then sensitivity of material is checked using what-if analysis. Then effect of project is checked to find optimum solution. This optimizes total project cost.

c) Budgetary Control:

For cost control on a project, the construction plan and the associated cash flow estimates can provide the baseline reference for subsequent project monitoring and control. For schedules, progress on individual activities and the achievement of milestone completions can be compared with the project schedule to monitor the progress of activities. Contract and job specifications provide the criteria by which to assess and assure the required quality of construction. The final or detailed cost estimate provides a baseline for the assessment of financial performance during the project. To the extent that costs are within the detailed cost estimate, then the project is thought to be under financial control. Overruns in particular cost categories signal the possibility of problems and give an indication of exactly what problems are being encountered.

- Using the discounted stream of costs and benefits, the following decision measures should be calculated: Net present value (NPV); Net present value per \$ of capital outlay (NPVI); Benefit-cost ratio (BCR); Internal rate of return (IRR)



Having taken into account the socio-economic impact of alternatives, their total annual cost has been determined using the following formula:



d) **Cost Optimization Techniques:**

Where,

$$SLCC=IC+OC+EC$$

In design, construction, and maintenance of any engineering system engineers have to take many technological and managerial decisions at several stages. So ultimate goal is to minimize the effort or to maximize desired benefit; various mathematical programming techniques are used for optimization of construction cost of project. Some of them are non-linear programming, dynamic programming, integer programming, stochastic programming etc.

e) **Cost Reduction Techniques at site:**

Contractor uses schedule to monitor the progress of the work which is related to cost. Inspection of work is done and comparison with budget is made. Meetings held to review the progress of work provides motivation to all workers and stake holders to improve their performance. Documentation of all activities or record keeping is important to enable detection of deviation from the set standards. Clients, consultants and the contractors use monitoring tools of budget, schedule and feedback to keep watch on cost performance. Quantification of work and comparing cost with bill quantities helps to evaluate the work and to check the progress of work.

The costs and benefits which can be quantified are only part of an economic evaluation. Other aspects, such as environmental considerations, industrial relations, social or regional impact, safety, public relations, resource availability, and similar, will also have to be taken into account in choosing between competing options. Once all costs and benefits over the life of the project have been identified and quantified, they are expressed in present value. In doing these:

- Costs and benefits should be valued in real terms: that is they should be expressed in constant dollars and increases in prices due to the general rate of inflation should not be included in the values placed on future benefits and costs.
- The stream of costs and benefits (expressed in real terms) should be discounted by a real discount rate of 7 per cent, with sensitivity testing using discount rates of 4 per cent and 10 per cent.

IC means investment costs OC means operating costs

EC means environmental costs related to waste collection

The above methodology conforms to the requirements for waste management analysis established by the traditional economic analysis has been complemented by socio-economic factors, and employed the same methodology.

Calculations of the annual investment cost (IC) have taken into account capital cost (%) and the expected service life of each investment item according to the following formula:

$$IC=NPV/(1-(1+r)^{-t})/r$$

Where r means capital cost (%) t means expected service life of investment item.

V. FUNDAMENTAL DIVISION OF COST

Reduced solid waste disposal costs – waste generation is reduced or is diverted to recycling streams resulting is less waste is being sent to the landfill for disposal and lower hauler charges. These include disposal fees, transportation costs, and predisposal treatment costs.

Input material cost savings – options that reduce scrap, reduce waste or increase internal recycling tend to decrease the demand for input materials

Changes in utility costs – utility costs may increase or decrease depending on the installation, modification, or removal of equipment

Changes in operating and maintenance labour/benefits – an alternative may increase or decrease labour requirements and the associated benefits. The may be reflected in changes in overtime hours or in the number of employees.



Changes in operating and maintenance supplies – an alternative may result in increased or decreased operating and maintenance supply usage.

Changes in overhead costs – large projects may increase or decrease these values.

Changes in revenues for increased (or decreased production) an alternative may result in an increase in the productivity of a unit. This will result in changes in revenue.

Increase revenue from by-products – an alternative may generate a by-product that can be sold to a recycler or sold to another company as material. This will increase a company's revenue.

Waste prediction tools offer excellent approach to waste management. However, their main problem is that they are not compatible with design tools. You waste a lot of time on waste, while manually entering the information”.

To work along with the owner and design team throughout the entire duration of the project while providing leadership to the construction process.

To determine a target budget and time frame for the completion of the project.

To monitor and maintain the project budget and schedule and quality requirements that has been established.

To advise and coordinate procurement of materials, equipment and the work of all construction contractors; this would span the spectrum of payment to contractors, inspection to establish conformation with the design as well as look over changes and claims.

VI. CONCLUSION

We have investigated economic aspects of different structure of costs was proposed for the evaluation of management scenarios.

- From total benefit analysis waste minimization & Reused material for reconstruction project cost decreased
- Planning and resource management for skilled Labour workers, new technology, information, and weather conditions are all elements that influence Highway construction productivity.
- Material planning is used to ensure that the project's requirements are met at various stages of construction
- Manpower planning is the process by which an organisation ensures that it has the proper amount and type of people, at the right time and in the right location, to complete the tasks that will assist the business achieve its overall objectives.
- Because training programmes can improve manpower productivity, they should be used on the job site, and manpower productivity statistics should be kept.

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REFERENCES

1. An Alternative Method for Traffic Accident Severity Prediction: Using Deep Forests Algorithm Jing Gan , Linheng Li , Dapeng Zhang , Ziwei Yi , and Qiaojun Xiang, Journal of Advanced Transportation, 21 December 2020
2. Integrating Accident and Travel Delay Externalities in an Urban Speed Reduction Context David A. Hensher, Transport Reviews: A Transnational Trans-disciplinary Journal, November 2014
3. Sindhu Vaardini, “Study on Cost Overruns in Construction Projects”, International Journal of Applied Engineering Research, (2016), Investigation of accuracy of pavement mechanistic empirical prediction performance by incorporating Level 1 inputs Md Mehedi Hasan, A.S.M. Asifur Rahman, Rafiqul A. Tarefder, Journal of Traffic & Transportation Engineering, & Science Direct 18 May 2019



4. Shabniya V, “Factors Affecting Construction Cost Estimation of Highway Projects Zhen Leng, AnandSreeram, Rabindra Kumar Padhan, Zhifei Tan, Value-added application of Concrete PET based additives in bituminous mixtures containing high percentage of reclaimed asphalt pavement (RAP), Journal of Cleaner Production, 196 (2018) 615-625.
5. Dharamveer Singh, Shashi bhushan Girimath, Toward Utilization of ground tire rubber and reclaimed pavement materials with asphalt Binder: Performance evaluation using essential work of fracture, International Journal of Pavement Research and Technology, 11 (2018) 594–602.
6. M.A. Lyubarskaya, V.S. Merkusheva, P.A. Osian, A. A. Ilin, E.S. Svintsov, Integrated Approach To Using Technology Of Reclaimed Asphalt Pavement (RAP), Procedia Engineering, 189 (2017) 860 – 866 .
7. Valdes-Vidal, A. Calabi- Floody, E. Sanchez-Alonso, Performance evaluation of warm mix asphalt involving natural zeolite and reclaimed asphalt pavement (RAP) for sustainable pavement construction, Construction and Highway Materials, 174 (2018) 576–585.
8. Gillette, H. P. and R. Dana, “Cost Keeping and Management Engineering”, Myron C. Clark Publishing Company, 2016
9. World Bank. 2018. Solid waste management in Bulgaria, Croatia, Poland and Romania. A cross-country analysis of sector challenges towards EU harmonization. Reports No.60078–ECA [online],
10. Den Boer, E.; den Boer, J.; Jager, J.; Rodrigo, J.; Meneses, M.; Castells, F.; Schanne, L. 2019. The use of life cycle assessment tool for the development of integrated waste management strategies for cities and regions with rapid growing economies LCA–IWM. Deliverable report on D3.1 and D3.2: Environmental sustainability criteria and indicators for waste management (Work Package 3). Technical University of Darmstadt, Darmstadt, Germany, 1–198.
11. Maheshi D. (2015). “Environmental and economic assessment of ‘open waste dump’ mining in Sri Lanka.” Resources, Conservation and Recycling, ELESVIER, 102, 67-79.
12. Zhou C., Gong Z., Hu J., Cao A. and Liang H. (2015). “A cost- benefit analysis of landfill mining and material recycling in China.” Waste Management, ELESVIER, 35, 191-198.
13. Jain M., (2012) “Economic aspects of construction waste materials in term of cost savings- A case of Indian construction industry”, International Journal of Scientific Research Publications, 2(10), 1-7.
14. Panas, A., Pantouvakis, J. P. Evaluating Research Methodology in Construction Productivity Studies. The Built & Human Environment Review. 3(1), 2010, pp. 63-85.
15. Rashidi, A., Rashidi Nejad, H., Maghiar, M. Productivity Estimation of Bulldozers using Generalized Linear Mixed Models. Journal of Civil Engineering. 18(6), 2014, pp. 1580- 1589.
16. Montaser, A., Bakry, I., Alshibani, A., Moselhi O. Estimating productivity of earthmoving operations using spatial technologies. Canadian Journal of Civil Engineering. 39(9), 2012, pp. 1072-1082
17. Montaser, A., Moselhi, O. Truck for earthmoving operations. Journal of Information Technology in Construction. 19, 2014, pp. 412-433.
18. Schabowicz, K., Hoła, B. Application of artificial neural networks in predicting earthmoving machinery effectiveness ratios. Archives of Civil and Mechanical Engineering. 8 (4), 2008, pp. 73-84



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