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"OVERCOMING THE CHALLENGE OF INTEGRATING CONNECTED VEHICLES AND INTELLIGENT TRANSPORTATION"

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Abstract: Intelligent transport systems vary in technologies applied, from basic management systems such as car navigation; traffic signal control systems; container management systems; variable message signs; automatic number plate recognition or speed cameras to monitor applications, such as security CCTV systems, and automatic incident detection or stopped vehicle detection systems; to more advanced applications that integrate live data and feedback from a number of other sources, such as parking guidance.

Information systems; weather information; bridge de-icing systems; Intelligent Transport Systems or ITS, are increasingly being used globally to improve road safety, reduce travel times and help improve decision making by road users by providing relevant and timely data. Broadly, the ITS applications for road safety can be divided into three operational areas Data collection, Information exchange and emergency response & Enforcement. The scenario is beginning to unfurl as the government has now recognized road safety as a major issue and has resolved to reduce accidents. Therefore, the implementation of Intelligent Transportation System along major urban corridors can resolve many traffic management safety issues, while creating a smart urban environment. And achieving the objectives with help of effective utilization of ITS.

Keywords: Intelligent Transport System, Vehicular Traffic; Emergency Vehicle; Stolen Vehicle; Congestion; Traffic Light.

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I INTRODUCTION

Vehicular traffic is one of the major problems to be addressed in a country, especially in major cities. The effects are worst in the case of emergency vehicles such as ambulance, fire engines etc. when they are struck in congestion. It may even lead to loss of lives of a few to many. Congestion occurs mainly due to two reasons, one is due to traffic lights and other is due to incidents such as accidents, vehicle breakdown etc. Congestion results in various problems such as increased average waiting time, decreased average distance travelled, increased pollution, increased fuel consumption etc. which in turn results in intolerance of drivers which may even lead to accident.



Though there are many solutions to overcome the traffic problem. One is to build new roads and widen existing roads. Another is to make effective and efficient utilization of the available ones. First one is very costly and needs more time. It also creates a lot of disturbance in the public. In some cases it can be said that first solution is literally impossible, whereas, the second solution is comparably easier to implement without disturbing the available infrastructures. Building new roads may be the permanent solution to some extent. But, without effectively utilizing the available ones, if we build new ones it is mere waste of resources and time. So by going for second solution i.e. by building an intelligent traffic management system we can make effective and efficient utilization of the available resources.

The objective of the project was to minimize time and cost by leveling the resources and this was done by taking three cases to compare the optimized results. In Case 1 the entire project was considered to be done in the same order of WBS without breaking it into parts and the cost incurred by the utilization of resources is calculated. In Case 2 the entire project was divided into two parts and the cost incurred by the utilization of resources is calculated. In Case 3 the entire project was divided into three parts and the cost incurred by the utilization of resources is calculated.

- Vehicular Traffic Management
- Traffic Light Control
- Rerouting
- Emergency Vehicle Management
- Traffic Light Control
- Rerouting
- Stolen Vehicle Management
- Defining "Intelligent Transport Systems"
- Traffic Management
- Economic Value
- Designing Master Plans And Formulating Standards

• Challenges Of The System

Planning and scheduling is an integral part required for efficient execution of construction activities. Project management software's are trending for helping the manager's for better handling of time and other resources. Microsoft Project is one such software aiding in increasing the overall project efficiency. In Road Construction, Equipment's play a major role as they manage more than 50 % of the work, so their Costs and Productivity play a major role in making the Project profitable to the company. In this work a Case Study of two Road or Pavement Construction sites is carried out. Efforts are taken to improve the Productivity of

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Equipment's by using Project Management Techniques which in turn helps to cut down the Costs incurred.

Resource Planning Construction Equipment: Production task needing equipment include excavating, handling, transporting, filling, compacting, grading, hoisting, concreting, pre-casting, plastering, finishing, trenching, and laying of pipes and cables. The supporting equipment at project site consists of generators, transmission lines, pumping sets, other utility services equipment. Construction equipment is indispensable in execution of modern high-cost, timebound massive construction projects. It produces output with an accelerated speed in a limited time. It saves manpower, which is becoming ever more costly and demanding. It improves productivity, quality and safety and also adds a sense of urgency. Acquisition of equipment mass involves initial heavy investment but, on the whole, its ads to profitability by reducing the overall costs, provided it is properly planned, economically procured and effectively managed.

Productivity means the ability to produce. The term 'productivity', as commonly understood, implies the ratio of output to input. The input and output can be measured in physical quantities, monetary terms or a combination of both. Many link productivity to mean of workers' output capability; they express productivity as work quantity produced per manhours of input. Productivity is also defined as monitory value of output per man-hour of input. Some consider productivity as performance output in rupees for every rupees of input. In the narrower sense of controlling project resources, the productivity concept is used to measure the performance of resources.

Problem Statement

"Provide highway and transit agencies with creative and innovative solutions that meet their transportation objectives. Our Intelligent Transport Services provides expertise in the planning, design, implementation, and operation of solutions that focus on maximizing system performance."

Literature review

Study On Resource Planning in Highway Construction Projects, K Swarna Kumari, J vikranth

In this paper they studied the resource planning and productivity can, thus help in good resource planning, better monitoring and overall controlling of the project. For the better understand they were taken a case study on B.R.T.S. project at Vishakhapatanam. At the site location they collected data in which the data wise requirement of project manpower, costly equipment, production costs, sales or earned value of work done and expected income. After collection of data they have done resource planning in that Planning of construction work force, planning of construction material, planning of construction equipment. The most general objective of planning is to improve to provide a link between the establishment of an effective productivity measurement system and the human task of improving organizational performance by means of changes in all or several elements of the organization-the people, structure, culture and technology. They observed that in highway projects, the same resource is often used for different activities and the productivity of that resource being different for different activities; it becomes inevitable to know the correct norms for correct estimation, planning and monitoring.

Equipment cost for any project comprises of mainly 20-30% of project cost plus additional cost for maintenance, repair and operation. Cost of equipment has to be controlled properly by efficient allocation of equipment for different phases of work. So for using equipment effectively and efficiently equipment becomes necessary. Equipment procurement is done after measuring productivity of every equipment. Material cost for any project which is more or less invariable, it depend mainly on type of project work to be performed. Material planning is done to achieve requirement of project at different phases of construction work and it also reduces excessive wastage of material. Manpower Planning is the process by which an organization ensures that it has the right number

and right kind of people, at the right place, at the right time, capable of effectively and efficiently completing those tasks that will help the organization achieve its overall objectives. In any project, most of the activities are done —team-wisel and productivity of individual labour cannot be determined. Also teams productivity is depend on driving equipment such as grader, roller, paver etc...

The Planning of BRTS Road Project by using Microsoft Project 2007 for 013 KMS and Existing Carriage indicate poor planning of resources. Also equipment assign for total project is less as compared to required number. From the planning of BRTS highway project after allocating resources to various activities, we come to know if Equipment and manpower is provided as per required data which is analyze by using Microsoft Project-2007 as compare to actual used on site. It will help to complete project on time with specified duration as per contract.

Resource Optimization in Road Construction Projects^[2] K sriBindu, U. Jayasanthosh Kumar

In this paper they studied in highway projects, the same resource is often used for different activities and the productivity of that resource being different for different activities, it becomes inevitable to know the correct norms for correct estimation, planning and monitoring. For the detailed study they taken three cases study and plan their resources by understanding productivity of each of the resource and its use for a particular activity using Microsoft project. They used MSP software for resourced planning, scheduling and allocation. In order to optimize the cost and duration in construction projects resource optimization is required. This may be used for the expansion of M.G Road from Patamata to Machilipatnam (NH-9).

The objective of the project was to minimize time and cost by levelling the resources and this was done by taking three cases to compare the optimized results. In Case 1 the entire project was considered to be done in the same order of WBS without breaking it into parts and the cost incurred by the utilization of resources is calculated. In Case 2 the entire project was divided into two parts and the cost incurred by the utilization of resources is calculated. In Case 3 the entire project was divided into three parts and the cost incurred by the utilization of resources is calculated.

Overall they concluded that by scheduling the project in three different types, three different time schedules are obtained and the respective resource allocations are also achieved. From the resource allocations and the time schedule of the three cases the optimal resource utilization is identified by the cost comparison. By performing the resource leveling the cost of the project has been reduced by Rs 9,27,474.72. From the above analysis conducted, the optimal solution is Case 2 with the reduction of cost to Rs 9,27,474.72 where the total cost is Rs 16, 70,59,530.3 which is the least cost of the three cases due to the reduction in duration.

Optimization of Resources in Highway Construction^[3] Vishnuraj RG, Vishak MS

The project is carried out to have a study about resource Management in highway constructions and its implementation. In recent year's project management software systems like MS Project, Primavera etc. have been improving continuously and recent versions have exhibited better interfaces, integrated planning and control features, and Internet capabilities. Yet, basic project management functions such as resource allocation, resource leveling, and time cost trade-off analysis have been the least improved. The Construction projects, especially the highway construction projects, uses huge amount of resources on and off the field in various forms of resources viz., materials, plants, equipment's and human resources along with money, time and space.. Production and operation sequence management is the process of controlling production and services the main objective of which is to match efforts with application of resources and equipment's in order to best produce and serve. Effort is made to use available resource and time in a desirable way and prevent resource and equipment waste. Data collection is done by questionnaire survey and it is used to find Benefits of resource management, causes of failure of resource management and causes of resource fluctuation etc.. Project management software primavera is used in order to complete the project on time under

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budget.

They concluded the visit to highway project site and study of available database in the project site reveals that the construction companies in India have neither yet realize the necessity of detail study of their own resources nor have develop their accounting system for research and development purpose has evident from the lack of useful and relevant data from the site. The present construction practices in India is still adopt the methodology of as and when required,, resource management. Lack of professionalism leading to lack of detailed and meticulous planning and irrational decision making as per site management is concerned leading to underutilization of resources to a great extent. Till now project resource planning is only limited to planning and scheduling with time but resource mobilization and usage planning according to their capacity and availability, ahead of time in the planning stage, is still nobody's concern. Equipment cost for any project comprises of mainly 20-30% of project cost plus additional cost for maintenance, repair and operation. Cost of equipment has to be controlled properly by efficient allocation of equipment for different phases of work. So for using equipment effectively and efficiently equipment becomes necessary. Equipment procurement is done after measuring productivity of every equipment. Material cost for any project which is more or less invariable, it depend mainly on type of project work to be performed.

Productivity Escalation and Cost Optimization of Equipment's used in Pavement Construction^[4]

Pankaj Suresh Rayamane, Amey A. Kelkar

In this paper they studied cost optimization of equipment used in pavement construction. The aim of this work is to highlight the importance of Productivity of Equipment's used in Pavement Construction and its Cost. In construction, some tasks are labour-intensive, some predominantly employ equipment and some use a combination of both, i.e., labour and equipment. In big infrastructure projects like Road or Pavement projects, equipment's and the plants play a crucial role in the production process. While the actual work done and the associated labour is accounted for by the foreman concerned, the equipment productivity control is undertaken to determine its employment time, the output achieved and its productivity at the site. The main purpose of equipment productivity control is to minimize the wastage in utilization and to minimize the Costs.

Planning and scheduling is an integral part required for efficient execution of construction activities. Project management software's are trending for helping the manager's for better handling of time and other resources. Microsoft Project is one such software aiding in increasing the overall project efficiency.

In Road Construction, Equipment's play a major role as they manage more than 50 % of the work, so their Costs and Productivity play a major role in making the Project profitable to the company. In this work a Case Study of two Road or Pavement Construction sites is carried out. Efforts are taken to improve the Productivity of Equipment's by using Project Management Techniques which in turn helps to cut down the Costs incurred.

A productivity management of road construction in Thailand Wisoot Jiradamkerng

This research's objectives were to conduct a work study of sub base course of road construction and implement productivity analysis with EZ Strobe simulation system. The study had divided construction process into 3 parts. Each part of the process was simulated with EZ Strobe to find optimum construction team members with minimum unit cost. These optimum team members were used in simulation model of each part to determine basic time with 95% confident interval and 5% limit of error. Then, the standard time and productivity of each construction team was calculated in various units; production per hour (cu.m./hr., sq.m./hr.), daily production (cu.m./day, sq.m./day, m. of road/day), and number of hour required per section of sub base course construction (200 m. in length). After that, the overall process simulation model including Part1 to Part3 was created, representing for all 26 sections of sub base course construction.

The analysis results showed that optimum team combination of Team1, Team2 and Team3 for the minimum unit cost of sub base construction was 2-1-2; and for the minimum duration of construction was 3-2-3. The outcomes of this research pointed out that, with EZ Strobe simulation system, the productivity management could be done effectively by conducting work study at project site and simulating for alternative resources management plan to determine for optimum construction teams according to the desired project goals.

AIM

Based on various literatures available, the problems are identified they are logically placed in three Clusters:

- ► Lack of Traffic Management System
- Homeland Security System and Vehicles Operation
- Vehicle to Vehicle Co-ordination and implementation of new technologies

OBJECTIVES

- To improve traffic safety
- To relieve traffic congestion
- > To improve transportation efficiency
- > To reduce air pollution
- To increase the energy efficiency
 To promote the development of related industries
 - To promote the development of related industr

Methodology

The main objective of our thesis work was to measure the resource productivity of a 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.



Fig: Flowchart of Methodology

For this thesis, relevant data was collected from selected highway project sites of Pune-Nashik National highway (NH50) constructing by IRB infrastructure developer's ltd through pre-designed questionnaire and collated for analysis.

Configuration of Traffic Control System A traffic control system largely consists of (i) information collection infrastructure, (ii) informationprocessing infrastructure, (iii) information provision infrastructure, (iv) communications infrastructure, and (v) monitoring infrastructure. In addition to the above infrastructures, disaster prevention infrastructure may be included if there are structures that need to be monitored, such as tunnels.



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The Architecture can be defined as a basic system organisation consisting of crucial components, their relations and connections to environment, as well as principles for system design and development during the whole lifecycle.

In order to enable development and upgrades, complex systems have to include additional characteristics such as: Compatibility, Expandability, Interoperability, Integrability, Standard ability.

Lack of architecture can result in difficulties because of incompatible components, higher cost for updates and complications in introducing or Faculty of Transport and Traffic Sciences Intelligent Transport Systems adjusting new technologies. ITS architecture provides a general framework for planning, designing and implementing integrated system in a given period and geographical area. An ITS Architecture is important for a number of reasons:

- \geq It ensures an open market for services and equipment, because there are "standard" interfaces between components;
- An open market permits economies of scale in production and distribution, thus reducing the price of products and services;
- It ensures consistency of information delivered to end-users; o it encourages investment in ITS since compatibility is ensured;
- it ensures inter-operability between components, even when they are produced by different manufacturers, which is also good for SMEs (Small and Medium sized Enterprises);
- It permits an appropriate level of technology independence and allows new technologies to be incorporated easily;
- \triangleright It provides the basis for a common understanding of the purpose and functions of the ITS, thus avoiding conflicting assumptions. Based on the content and mandatory use, three main type of ITS Architecture are defined:
 - ۶ Framework ITS Architecture;
 - Mandated ITS Architecture;
 - Service ITS Architecture,

Attributes:

1	Lack of surveillance	from
2	Failure of contributors to instantly handle changes	using
3	variations in legislation and guidelines	differe
4	Lack of understanding	conduc
5	Incompetent designer	projec
6	Poor communications among project contributors	project
7	Lack of cooperation among contributors	project
8	Indistinct contract documents	project
9	Impracticable expectations by the parties	
10	The impact of local culture.	1000
11	Misinterpretation of contracts	1.000
12	Lack of resources	Serve also
13	Poor communication and documentation	And Address
14	Late involvement of lawyers in the construction projects	
15	Tendency of lower price offer	and the second second
16	Working relations and Supervision	100
17	Circumstances produces a model based on project uncertainty	States of States
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18	Dispute in construction contracts: Alterations
19	Lack of effective communication among project contributors
20	Delayed payments
21	Design insufficiency
22	Lack of necessary proficiency and experience
23	Poor site management
24	Poor planning and programming
25	Project hampers health of people and damage the natural
	setting of flora
26	Disputes with subcontractors
27	Late imbursement to subcontractors
28	Harmonization of subcontractors
29	Alterations to standard conditions of contract
30	People seeking more benefit from the project
31	Inappropriate contract type
32	Accident due to moving traffic adjacent to project site
33	Disputes due to discrepancy in contract document
34	Lack of professionalism of participants
35	Weather Conditions
36	Availability of health and safety training
37	Inappropriate in salary, poor wages, Lack of Financial
	motivations
38	Inaccurate design information and incomplete tender
	Information
39	Inappropriate Contractor Selection
40	Lack of training sessions, lack of labour recognitions programs,
	lack of place for eating & relaxation, Lack of team spirit
41	Decisiveness of the agreement
42	The location and implementation of work
43	Minimized costs in attaining settlement
44	Sustained business relations
45	Control of the result and procedure

DATA COLLECTION & EXPERIMENTATION

The primary objectives of this field experiment were to

- Determine whether the WRITE system is feasible for measuring construction productivity and
- Identify the advantages and limitations of this system by conducting a case study.

To accomplish the objective, productivity data were collected simultaneously by using the different methods and the WRITE system.

The stopwatch method is a classic productivity measurement method develops. The method uses a stopwatch to record the time spent on each human movement to complete an operation and categorizes each movement as direct work, supportive work, or nonworking. The productivity is computed on the basis of the percentages of direct work, supportive work, and nonworking within certain duration. Results from the stopwatch method and the WRITE system were compared by using statistical methods to determine whether there was a significant difference. Figure shows a data collection form for this project and a sample data set that was used for statistical analysis. The field experiment was conducted at three asphalt paving projects and one bridge reconstruction project. Hot-mix asphalt overlay project and two hot-in-place recycling projects were selected as equipment-intensive projects, and the bridge reconstruction project was deemed to be a labour-intensive project.



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Resource productivity as well as labour and capital productivity is indicators that reflect both the development of the economy and the environment. However, the interrelationships between socio-economic and environmental processes are highly complex and available information, judgment of experts and public awareness are often controversial. Therefore, the criterion of policy relevance from this study refers to a reduction of this complexity rather than to a full understanding. In other words, it refers to the capacity of reducing this complexity and providing relevant and useful information for decision making and public discourse.

This scoping study provides evidence that data availability and quality is essential for assessing the impacts of resource productivity on employment.

In recent years, decision makers asked for establishing RMC as the lead indicator for the EU resource efficiency strategy. For this purpose it is important to supplement figures on a country level34. Recently, Eurostat has published the 'Country RME tool' for compiling RME-related estimates at the country level. Since RMC/RME-based estimates at the country level are challenging, calculating RME of product flows at sectoral levels for all EU Member States would be rather difficult. However, examining resource productivity at the sectoral level is of great importance as each sector shows different material use patterns.

A feasible solution might be to focus on some sectors for representative countries. Still, constructing a time series might turn out to be resource and time consuming. Another option includes case studies on individual country experiences which could prove to be useful for other Member States. For example, the construction sector is one of the most important sectors in the European Union. It generates about 10% of GDP and positively influences the growth of employment in other related economic activities. Furthermore, the Netherlands could be an interesting country to study for its high resource productivity in the agricultural and the construction sector.

An already well-established and regularly updated project is the Exiobase36 - a global, detailed Multi-regional Environmentally Extended Supply and Use / Input Output (MR EE SUT/IOT) database. Version 3 will comprise 200 sectors in 44 countries and 5 rests of the world regions. According to involved partners, sectoral data will possibly be available in 2016.

Another approach is to use just direct extraction all over the world data in primarily monetary models and estimate the impact of policies on the extraction in relation to growth and employment effects. Even if this does not explicitly deliver figures for productivity, it reveals the relative effects on labour, capital and resources on regional and global levels, which can be used to further analyze the productivities in question.

In addition, there is a lack of adequately measuring the quality of labour inputs, accounting for skills, gender, education and employment status of the workers. Eurostat, in collaboration with the JRC-IPTS, is currently running a project that aims at improving labour productivity indices by disseminating time series of productivity indicators for Member States. The first dataset will be available in spring for the years to. Data on capital productivity should follow later.

Another way forward would be the development of a more comprehensive econometric analysis that would allow a better understanding of the relationship between potential drivers such as R&D and energy demand. As the examined variables show a significant relationship with resource productivity, going on a sector-by-sector analysis would provide insights as for example to which sectors are receiving more R&D and in which countries R&D is having the most

impact on productivity. Accommodating or systematically examining more potential drivers is an integral aspect of a future econometric analysis.

The empirical part of our analysis – as of many other studies - was based on describing correlations rather than the causalities. This is due to the fact that the identification of causal relationships is a difficult task in terms of methodology and goes beyond the scope of this study. Finding causalities was left to the literature review, where we described the results of some comprehensive modelling efforts that show the interlink ages between resource productivity improvements and social, environmental and economic indicators.

In conclusion, the empirical part of this scoping study was not only an exercise to provide a preliminary statistical and empirical analysis of resource, labour and capital productivity, but also to open up possibilities for further investigation, once data will be available. Some topics that could possibly be explored through future analyses comprise:

• Investigation of sectors which would be most affected by job losses due to resource efficiency policies or, in general, the transition towards a more resource efficient economy in the EU

• Analysis of whom within the labour force would be most susceptible to shifts in employment (which skill level, age group).

• Studying of sectors that show high levels of capital investment and whether those sectors are the most/least resource/labour productive. A question to look at is whether labour is being replaced by capital in these most/least resource productive sectors.

• Understanding of the effects of R&D on resource productivity on a sector level, comparing between Member States and establishing reasons for differences, if there are some

DATA ANALYSIS & EXPERIMENTATION

The questionnaire were distributed over large construction as well as small construction projects including the group of workers including site engineers, Painter, steel binder, Plasterer, Meson Brickwork, Carpenter, Gardener for Landscaping and many more.

One of the most important stages was to collect accurate data, the total number of questionnaires sent was and the number of responses received and validated. This figure is greater than the required sample size, so the data obtained satisfies the quality requirements. The results of the survey were synthesized by the author and evaluated the impact, which are divided into seven groups of factors affecting the labour productivity of construction workers on sites in as follows. **Ranking of factors on workers themselves**

Factors	RII	Impact	Ranking
Experience of workers	4.29	Very high	5
Labour Discipline	4.12	Very high	5
Physical ability	4.01	High	4
Psychophysiology ability	3.78	High	4
Labour Intensity	3.52	Mid	3
Age	3.41	Low	2
Gender	3.19	Extreme Low	1
Level of training	3.09	Extreme Low	1

The lower the labour intensity, the lower the labour productivity, the physiological psychological problems of people will affect the efficiency of work thus affecting the labour productivity. The higher the age, the more accumulated experience, but the physical strength can be reduced, thus greatly affecting labour productivity.

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Kanking of operational and managerial factors									
Factors	RII	Impact	Rank						
Ability to organize Production	4.23	Very high	5						
Construction supervision	4.20	High	4						
Application of technology	3.92	Mid	3						
Workers' arrangement	3.73	Low	2						
Labours Communication	2.89	Extreme low	1						

Ranking of factors that motivate employees

Factors	RII	Impact	Ran
			king
Types of salary payment	4.27	Very high	5
Staff Support	4.05	High	4
Reward Mechanism	3.69	High	4
Spiritual Life	3.58	Mid	3
Training and improving skills	3.32	Low	2
Initiative at work	3.18	Extreme low	1

Professional training, skills upgrading and innovations in labour are factors that have high impact on labour productivity. These factors directly influence the motivation of employees, bring satisfaction and sense of responsibility of construction workers to the work

High-impact factor is the complexity of the work with RII = 3.78 and factor of material transport methods with RII = 3.22. These factors affect the performance of the work that will also affect labour productivity as reported. In order to ensure the achievement and growth of labour productivity, organizations need to utilize machines, equipment and tools which must be suitable with products and technologies; ensure routine readiness and operation throughout the working shift; ensure raw materials, semi-finished products putting into production must have evident origin and qualification.

Ranking of natural environmental factors

Factors	RII	Impact	Ranking
Weather conditions	4.82	Very High	5
Regulations,	3.42	High	4
Geological and	3.27	Mid	3
hydrological conditions	3.12	Low	2
laws on construction	3.02	Extreme Low	1

Weather factor is a factor that has a high impact on labour productivity and is ranked first with RII of 3.82. Most construction works are built in natural spaces, where are affected directly by the weather. The weather not supporting or sometimes becoming **Ranking of factors of working tools and object**

severe has a not small impact on labour productivity. The role of natural conditions for labour productivity is objective and unavoidable. Therefore, to ensure the achievement and increase productivity, construction firms need to anticipate the difficulties arising due to natural environment conditions to mitigate risks in the production process. The second most influential factor is the factor of regulations on construction with RII = 3.42. Regulations and national policies that influence the goals and direction of the production of the construction firms, affecting the organizational policies for workers on wages, investment in science and technology, so on, thus affecting productivity.

Experimental Determination of material properties

Various tests will be carried out on the materials used in Waste tyre rubber bitumen. The following tests will be carried out on materials:

- 1) Bitumen with Partial Replacement with Waste Plastic
- Standard Penetration Test [IS: 73 (1950-62-92)]
- Softening Point Test [IS: 73 (1950-62-92)]

Factors	RII	Impact	Ran king
Quality of materials	4.25	Very High	5
Quality of working tools	4.01	High	4
Complexity of works	3.72	Low	2
Material transport methods	3.02	Extreme Low	1

- Ductility Test [IS: 73 (1950-62-92)]
- Stripping Value Test [IS: 73 (1950-62-92)]
- Marshall Stability Test [IS: 73 (1950-62-92)] (For bituminous mix containing both Waste plastic and Reclaimed Asphalt Pavement)

2) Fine Aggregate and Coarse Aggregate with Partial Replacement of Reclaimed Asphalt Pavement

- Flakiness Index [IS 2386]
- Elongation Index [IS 2386]
- ▶ Impact Value [IS 2386]
- Sieve size analysis [IS 2386]
- Specific Gravity [IS 2386]
- ➢ Water Absorption Test (%) [IS 2386]

These all testing will be done for all the design mix to determine the mechanical properties and durability of the specimens and Results will be find out for all the tests of all design mix and it will be compare.

Properties of Bitumen

Properties	Bitumen Grade 60/70
Penetration	63
Softening Point	62 C
Ductility	64.5 mm

1. For various Tests for Bitumen Replaced by Waste Plastic

Waste Plastic in Percentage of Weight of bitumen	0%	5%	10%	15%	20%	25%	Total No. of Samples
Standard Penetration Test	1	1	1	1	1	1	5
Softening Point Test	1	1	1	1	1	1	5
Ductility Test	1	1	1	1	1	1	5

2. For various Tests for NA Replaced by Reclaimed Asphalt Pavement



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Weight of RAP in percentage of weight of Natural aggregate	0%	10%	20%	30%	40%	50%	Total No. of Samples
Flakiness and Elongation Index	1	1	1	1	1	1	5
Sieve Analysis	1	1	1	1	1	1	5
Specific Gravity	1	1	1	1	1	1	5
Water Absorption Test	1	1	1	1	1	1	5
Impact Value Test	1	1	1	1	1	1	5
Crushing Value Test	1	1	1	1	1	1	5

3. For Marshall Stability Test

Waste Plastic	0%	5%	10%	15%	20%	25%					
RAP		No. of Samples									
0%	3	3	3	3	3	3					
10%	3	3	3	3	3	3					
20%	3	3	3	3	3	3					
30%	3	3	3	3	3	3					
40%	3	3	3	3	3	3					
50%	3	3	3	3	3	3					

(Plastic Content	Wt. of Sample		Bul k Sp. Gr.	VM A (%)	VFB (%)	Viscosity grade		Viscosity grade		Mod Bitur H Clir	lified nen – ot nate	Mod Bitur Ca Clir	ified nen – old nate	Marshal l
, KAP Content)(%)	Air (gm.)	Wate r (gm.)	Of Sa mpl e			Avg MS	Avg Flo W	Avg MS	Avg Flo W	Avg MS	Avg Flo W	stability (KN)		
(0,0)	1201.7	755.9	3.46	12.86	63.92	3.29	3.59	22.1	3.28	18.6	5.4	11.67		
(0,10)	1273.8	776.3	2.63	12.76	59.44	3.58	3.19	20.1	3.48	16.5	5.1	11.22		
(0,20)	1273.7	741.8	2.34	10.81	59.04	2.56	2.82	16.8	3.28	10.9	4.7	10.54		
(00,30)	1281.6	726.6	2.89	7.25	58.83	3.96	3.30	18.8	4.40	12.3	5.2	10.01		
(0,40)	1260.0	708.4	2.71	6.69	57.57	2.42	2.99	13.6	3.58	13.1	3.9	9.85		
(0,50)	1209.1	753.0	3.17	6.11	57.45	3.51	2.51	23.8	3.72	17.4	3.9	9.57		

Observation Table & Test Results: Test Results & Minimum Requirements For Paving Grades (IS 73: 2013) Sr.No Name of the test Test results VG 10 VG 20 VG 30 VG 40 Test Method IS 1202-1978 Specific Gravity 8 8 Penetration at 25 Deg C in 45 2 53 80 60 35 IS 1203-1978 1/10 of mm Absolute viscosity at 60 Deg 3 ·__· 800-1200 1600-2400 2400-3600 3200-4800 IS 1206 (P2) C in Poises Kinematic viscosity at 135 4 "__" 250 300 350 400 IS 1206 (P3) Deg C in cSt *Flash Point (Cleveland open 5 220 220 220 220 IS 1448 Part 69 cup) in Deg C Softening point(R & B) in 47 40 45 47 50 IS 1205 -1978 Deg C Ductility at 25 Deg C in cm 100 75 50 40 25 IS 1208-1978 *Loss on heating in ۰<u>.</u>... 8 . . IS 1212-1978 percentage

			Observ	ation Table & Test	Results:					
Sieve Analysis of	f Fine Aggr	egate as pe	r IS2386, P-1 2016		Percentage passing	as per IS 383-2016				
Sr. No.	Sieve S	ize -mm	Percentage passing- %	Grading Zone I	Grading Zone II	Grading Zone III	Grading Zone IV			
1	1	0	100.0	100	100	100	100			
2	4	75	98.8	90-100	90-100	90-100	95-100			
3	2.	36	88.1	60-95	75-100	85-100	95-100			
4	1.	18	51.7	30-70	55-90	75-100	90-100			
5	0	.6	34.5	15-34	35-59	60-79	80-100			
6	0	.3	25.7	5-20	8-30	12-40	15-50			
7	0.	.15	18.2	0-10	0-10	0-10	0-15			
Fineness	Modulus -	%	2.83							
Sand Confirming of IS	as per clau 383-2016	se no. 4.3	"Ia							
Test Particu	ılar		Unit	Test results	Test Me	thod	Specified limit			
Specific Gra	vity			2.64	IS 2386 P3	- 2016				
Water absorp	ntion		%	3.48	IS 2386 P3	- 2016				

Observation Table & Test Results

			COULTAILON 140		01		
	Sieve analys	is of coarse aggrega	te and specified p	ercentage passing	as per IS-383:197	0 (RA) 2016	
Sr.No	Sieve Size in mm	Percent Passing	10mm-Single Size	20mm-Single size	20mm-Graded size	40mm -Single size	40mm Graded size
1	40	100.0	-	100	100	85-100	95-100
2	25	100.0					
3	20	98.8		85-100	95-100	0-20	30-70
4	16	48.1					
5	12.5	8.9	100	-		-	
6	10	0.6	85-100	0-20	25-55	0-5	10-35
7	4.75	0.0	0-20	0-5	0-10	-	0-5
8	2.36	0.0	0-5	-	-	-	
Test Partic	cular	Unit	Test	Result	Test method	Spe	cified Limit
Sp. Grav	ity		2	.9	IS 2386 P: 3-20	16	
Water Abso	rption	%	0.	99	IS 2386 P: 3-20	16	
Aggragate Crusl	hing value	%	16	.96	IS 2386 P 4 - 20	16 Max 45 surfac Wea	% Non wearing ce Max. 30% - aring surface
Flakiness I	ndex	%	3.	52	IS 2386 P1:201	6	
Elongation	Index	%	3.	47	IS 2386 P 1-20	16	
Aggregate Imp	act value	%	15	.03	IS 2386 P 4 -20	16 Max 45 surfac Wea	% Non wearing e Max. 30% - aring surface

CASE STUDY SOLAPUR – DHULE Highway Project

4-Laning of Solapur-Dhule 211 (New NH-52) from 00.000 KM to 453.000 KM in the state of Maharashtra to be executed as BOT (Toll) on DBFOT Pattern under NHDP.

This route is one of the major high density traffic highways in India. Poor existing pavement condition, unhealthy condition of several cross drainage structures and increasing traffic volume levels on this road indicated an urgent need to improve and augment the capacity of the road Infrastructure. The project consists of up gradation and strengthening of the existing 2 lane carriageway and widening the same to 4 lane dual carriageway, improving and rehabilitation or reconstruction of cross drainage structures between Solapur-Dhule sections of NH-211. The project is being done through Public Private Participation (PPP) on Build Operate Transfer (BOT) basis. The concessionaire/Operator's scope include Designing, Constructing, Maintaining and Operating the project corridor for a period of 29 years and then will transfer the project operations in hands of NHAI. **SALIENT FEATURES**

Name of Project	"Four Laning of Solapur to Yedeshi Section of
	NH-211 from Km 0.000 to Km 100.000 (Design
	Length - 98.717 Km) in the State of Maharashtra
	to be executed as BOT (Toll) on DBFOT Pattern
	under NHDP Phase - IV"
Total Length of	98.717 Km
Project	
Contract / Phase	Phase NHDP Phase – IV
Client / Authority	National Highways Authority of India. (Ministry
	of Shipping, Road Transport & Highways).
Concessionaire	M/s. Solapur Yedeshi Toll way Private Limited

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INTERNATIONAL JOURNAL OF ADVANCE SCIENTIFIC RESEARCH & ENGINEERING TRENDS

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Independent	M/s. SA Infrastructure Consultants Pvt. Ltd. In
Engineer	Association with Dhruv Consultancy Services
	Pvt.Ltd.
Project Management	M/s. Sowil Limited
Assistant	
EPC Contractor	M/s. IRB / MRM Pvt. Ltd. Design
Consultant	M/s. STUP Consultants Private Limited
Bankers	IDBI Bank
Total Project Cost	INR 972.50 Crore.
Date of Signing of	03rd March 2014
Concession	
Agreement	
Appointed date	21st January 2015
Scheduled Four-	910th (nine hundred and tenth) day from the
Laning Date	Appointed date (18.07.2017).
Concession Period	29 Years Commencing from the Appointed Date.



SR.NO.	TYPES OF STRUCTURES	NO. OF STRUCTURES
1	Major Bridges	2
2	Minor Bridges	24
3	ROB	1
4	Pipe Culverts	115
5	Slab Culverts/Box Culverts	6
6	Vehicular Overpasses	1
7	Vehicular and Non-Vehicular	1
	Underpasses	

Following are the Proposed Structures in the Project Site: SR.NO. **TYPES OF STRUCTURES** No. of Struct. 1 Major Bridges 2 2 Minor Bridges 25 3 ROB 1 4 Flyover / Vehicular Underpasses 7 Pedestrian / Cattle Underpasses 5 11 6 Box Culverts 11

RESULT & DISCUSSION R-II Method Results

Sr. No.	Questions	YES(1)	No(2)	CANT SAY(3	Total		
1	Have you keard about Construction Vaste management?	80	20	0	100	percent	0.33
2	Are you aware of waste management in your area?	70	25	5	100	percent	0.35
3	Do you ever noticed Construction waste in the road, public area and Land?	97.5	0	25	100	percent	0.37
4	In India, Do you thing Construction waste management is good?	42.5	42.5	15	100	percent	0.4
5	Do you know India recycle just one per cent of its construction and demolition waste?	60	40	0	100	percent	0.4
6	Do you thing Construction waste management is necessary?	90	0	10	100	percent	0.4
7	Vill you know construction waste management rule is mention from ministry of environment?	25	67.5	7.5	100	percent	0.41
8	Have you ever heard about the importance of recycling in construction industry?	40	47.5	12.5	100	percent	0.42
9	Do you use construction waste management system on your site?	35	52.5	12.5	100	percent	0.42
10	Have you use any method for waste disposal or Recycling material?	60	32.5	7.5	100	percent	0.42
11	Does it effect on quality using recycled material?	40	55	5	100	percent	0.43
12	Does cost-benefit analysis affect the project cost?	92.5	5	25	100	percent	0.43
13	Do you think there is enough information about the environmental impact due to Construction waste?	20	70	10	100	percent	0.45
14	Do you think Construction and demolishing waste management has impact on sustainable development?	87.5	0	12.5	100	percent	0.47
15	Can you say that to increase project productivity by reducing and eliminating the wastes?	82.5	12.5	5	100	percent	0.48
16	Do you think by decreasing waste we can decrease the project cost?	82.5	10	7.5	100	percent	0.48
17	Do you think using recycle material benefit the total project cost?	85	0	15	100	percent	0.48
18	Have construction vaste management have effect on project cost?	65	22.5	12.5	100	percent	0.49
19	Do you think most environmental issues in India could be minimized if Construction Vaste is managed properly?	80	15	5	100	percent	0.49
20	Do you think Cost benefits analysis should be done before starting construction?	42.5	45	12.5	100	percent	0.5
21	Do you think by using automation technique vastages of material is decreased?	67.5	22.5	10	100	percent	0.51
22	Do you use new technology for construction of building?	42.5	55	25	100	percent	0.53
23	Is that affect in reducing wastages?	80	20	0	100	percent	0.54
24	By giving proper training to mason increase the productivity of work and decreases the wastages of material?	62.5	25	12.5	100	percent	0.55
25	Not following construction step induced rework and that also increase construction waste?	62.5	12.5	25	100	percent	0.57
26	Does electrical and plumbing work increase the rework?	67.5	20	12.5	100	percent	0.58
27	By proper storage of material on site reduced the wastages of material?	80	10	10	100	percent	0.58
28	Do you think main reason of steel vaste is because of irresponsible beam reinforcement and fabrication outting?	72.5	10	17.5	100	percent	0.59
29	Do you think using RMC over traditional method decreased the waste of material?	60	27.5	12.5	100	percent	0.61
30	Now, do you use Construction vaste management system on your site to increase the productivity and decreasing the cost of project?	100	0	0	100	percent	0.63

Sr.No.	Questions	YESI1	No(2)	Other(3)	Total	Total Number(N)	AxN	RI	Ranks	MEAN	std Deviation	Variance
1	Have you heard about Construction Waste management?	80	40	0	120	100	300	0.4	4	12	0.405	0.164
2	Are you aware of vaste management in your area?	מ	50	15	135	100	300	0.45	8	14	0.580	0.336
3	Doyou evernoticed Construction waste in the road, public area and Land?	97.5	0	7.5	105	100	300	0.35	2	- 11	0.316	0.100
4	In India, Do you thing Construction waste management is good?	425	85	45	172.5	100	300	0.58	18	17	0.716	0.512
5	Do you know India recycle just one per cent of its construction and demolition waste?	60	80	0	140	100	300	0.47	9	14	0.496	0.246
6	Do you'hing Construction waste management is necessary?	90	0	30	120	100	300	0.4	4	12	0.608	0.369
1	Wilyou know construction waste management rule is mention from ministry of environment?	25	135	22.5	182.5	100	300	0.61	20	18	0.549	0.302
8	Have you ever heard about the importance of recycling in construction industry?	40	95	37.5	172.5	100	300	0.58	18	17	0.679	0.461
9	Do you use construction waste management system on your site?	35	105	37.5	177.5	100	300	0.59	19	18	0.660	0.435
10	Have you use any method for vaste disposal or Recycling material?	60	65	22.5	147.5	100	300	0.49	-11	15	0.640	0.410
1	Does it effect on quality using recycled material?	40	110	15	165	100	300	0.55	16	17	0.580	0.336
12	Does cost-benefit analysis affect the project cost?	92.5	10	7.5	110	100	300	0.37	3	- 11	0.379	0.144
13	Do you think there is enough information about the environmental impact due to Construction vaste?	20	140	30	190	100	300	0.63	21	19	0.545	0.297
14	Do you think Construction and demolishing wasternanagement has impact on sustainable development?	87.5	0	37.5	125	100	300	0.42	6	13	0.670	0.449
15	Can you say that to increase project productivity by reducing and eliminating the vastes?	82.5	25	15	122.5	100	300	0.41	5	12	0.530	0.281
16	Do you think by decreasing waste we can decrease the project cost?	82.5	20	22.5	125	100	300	0.42	6	13	0.588	0.346
17	Do you think using recycle material benefit the total project cost?	85	0	45	t30	100	300	0.43	1	13	0.723	0.523
18	Have construction wastemanagement have effect on project cost?	65	45	37.5	147.5	100	300	0.49	-11	15	0.716	0.512
19	Do you think most environmental issues in India could be minimized if Construction Waste is managed properly?	80	30	15	125	100	300	0.42	6	13	0.543	0.295
20	Do you'hink Cost benefits analysis should be done before starting construction?	425	90	37.5	170	100	300	0.57	17	17	0.687	0.472
21	Do you'hink by using automation technique wastages of materialis decreased?	67.5	45	30	142.5	100	300	0.48	10	14	0.675	0.456
22	Doyauuse new technology for construction of building?	425	110	7.5	160	100	300	0.53	14	16	0.545	0.297
23	Is that affect in reducing wastages?	80	40	0	120	100	300	0.4	4	12	0.405	0.164
24	By giving proper training to mason increase the productivity of work and decreases the wastages of material?	62.5	50	37.5	150	100	300	0.5	12	15	0.716	0.513
25	Notfolloving construction step induced revolk and that also increase construction waste?	62.5	25	75	162.5	100	300	0.54	15	16	0.868	0.753
26	Does electrical and plumbing work increase the revork?	67.5	40	37.5	145	100	300	0.48	10	15	0,714	0.510
27	By proper storage of material on site reduced the wastages of material?	80	20	30	130	100	300	0.43	1	13	0.648	0.421
28	Do you'hink main reason of steel waste is because of inesponsible beam reinforcement and fabrication cutting?	725	20	52.5	145	100	300	0.48	10	15	0.783	0.613
29	Do you think using RMC over traditional method decreased the waste of material?	60	55	37.5	152.5	100	300	0.51	13	15	0.716	0.512
30	Now, do you use Construction waste management system on your site to increase the productivity and decreasing the cost	100	0	0	100	100	300	0.33	1	10	0.000	0.000

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Pipe Culverts

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2 Aeyou was of variant magnet hou area? 40 1 3 14 0.950 0.331 2 by our was of variant magnet hou area? 40 1 3 11 0.950 0.331 2 by our was of variant magnet hou are how are how and unit? 40 1 3 11 0.956 0.17 2 by our brig Consulton was en magnetifies grow? 40 1 2 14 0.456 0.924 3 by our brig Consulton was en magnetifies or easies? 40 1 3 12 0.680 0.838 4 by our brig Consulton was en magnetifies or easies? 40 1 3 12 0.680 0.838 9 by our exonal was of easies of easies of easies? 40 1 3 17 0.673 0.461 1 by our exonal was one of easies of exolution industry easies? 40 1 3 17 0.690 0.338 1 by our exonal was one of one of exologies on one of exologies on one of easies of exologies on one of easies of exologies on one of exologies one one of exologies one	1	Have you heard about Construction Waste management?	40	1	2	12	0.405	0.164
3 Doyover rotoclomator arter his vad pable are and Lard? 40 1 3 11 0.36 0.1 4 hinds, Doyoving Comuctors arter margements goot? 40 1 3 17 0.76 0.52 2 Doyoving Comuctors arter margements goot? 40 1 2 14 0.458 0.248 2 Doyoving Comuctors arter margements reseases? 40 1 3 12 0.088 0.333 1 Hig volume comuctors arter margement selesses? 40 1 3 18 0.680 0.833 2 Doyoving Comuctors arter margement selesses? 40 1 3 18 0.680 0.481 3 Doyoving comuctors arter margement selesses 40 1 3 17 0.667 0.445 1 Doyoving comuctors arter margement selesses 40 1 3 11 0.073 0.441 1 Doyovink for boyove any eleving constructure arter any eleving cons	2	Are you aware of waste management in your area?	40	1	3	14	0.580	0.336
 In Ida, Dysovfing Construction are margement is good? In Ida, Dysovfing Construction are margement good? In Ida, Dysovfing Construction are margement in exercise? In Ida, Dysovfing Construction are discovfing margement in exercise? In Idea or margement and the margement and exercise in exercise? In Idea or margement and the margement and exercise in exercise? In Idea or margement and the margement and exercise in exercise? In Idea or margement and exercise and exercise in exercise? In Idea or margement and exercise exercise or margement andexercise in exercise?<td>3</td><td>Do you ever noticed Construction waste in the road, public area and Land?</td><td>40</td><td>1</td><td>3</td><td>11</td><td>0.316</td><td>0.1</td>	3	Do you ever noticed Construction waste in the road, public area and Land?	40	1	3	11	0.316	0.1
S Doyulrov halaeopelijit one per cent dis contruction and denolition vate? 40 1 2 14 0.458 0.268 B Doyuling Contruction vate management is meetangine in the internation minimal verticement? 40 1 3 12 0.068 0.088 0.038 M Puo Jono controlon vate management is meetangine in the internation minimal verticement? 40 1 3 17 0.613 0.461 S Doyule controlon vate management system on you sit? 40 1 3 17 0.613 0.461 Des vertice on paily und recorded rus as desorder Peopling parate? 40 1 3 17 0.500 0.338 Des vertice on paily und recorded rus as desorder Peopling parate? 40 1 3 17 0.500 0.338 Des vertice on paily und recorded rus as desorder Peopling parate? 40 1 3 13 0.570 0.441 Doyulinit by devise record recorder of the protect cost? 40 1 3 13 0.550 0.237 Disputinit by devise record recorder adverter interpart cost paratella development? 40 1 3	4	In India, Do you thing Construction waste management is good?	40	1	3	17	0.716	0.512
EDcyching Contruction state margament is resease? 40 1 3 12 0.088 0.383 If you have contruction state margament hale instruction minimity of environment? 40 1 3 12 0.088 0.383 If you have contruction state margament hale instruction holds? 40 1 3 18 0.054 0.033 Dispute contruction state margament optim construction holds? 40 1 3 18 0.064 0.441 Dispute contruction state margament optim construction holds? 40 1 3 18 0.064 0.441 Dispute contruction state margament system or your sta? 40 1 3 11 0.038 Dispute contruction state margament system and the construction value? 40 1 3 11 0.038 Dispute hist construction add on the project con? 40 1 3 11 0.038 0.044 Dispute hist construction add development 40 1 3 12 0.058 0.045 0.028 Dispute hist consearch spopic con? 40	5	Do you know India recycle just one per cent of its construction and demolition waste?	40	1	2	14	0.496	0.246
T Majou horis constructions are margament rule is retriction ministry of environmen? 40 1 3 18 0.058 0.021 By the powerh and dout the margament rule is retriction in don? 40 1 3 17 0.658 0.021 By the powerh and dout the margament rule is retriction in don? 40 1 3 17 0.658 0.042 Dispuse construction wate margament rule is retriction in don? 40 1 3 15 0.640 0.41 Description wate margament rule is retriction wate disposed records? 40 1 3 17 0.658 0.328 Description rule rule and and rule retriction wate? 40 1 3 13 0.655 0.271 Description rule rule and and rule retriction rule is record, rule rule rule and and rule rule rule rule rule rule rule rule	6	Do you thing Construction vaste management is necessary?	40	1	3	12	0.608	0.369
B Their power head about the importance directority on construction holony? 40 1 3 17 0.0678 0.461 3 Cip-our exercitation wate management system or youth and the construction holony? 40 1 3 17 0.0678 0.461 10 Devouwee controllor wate management system or youth and the construction water anagement system of youth and the construction water and the construction water and the construction water anagement has impact on sustainable development? 40 1 3 17 0.0580 0.0381 11 Dopush the interse system of youth and on the enconnent alignant dave to Construction water? 40 1 3 11 0.0378 0.044 12 Dopush the interse system of youth and on the enconnent alignant dave to Construction water? 40 1 3 13 0.0570 0.2471 12 Dopush the interse system of youth and on the enconnent alignant dave to Construction water? 40 1 3 12 0.0530 0.2381 12 Dopush the interse system of youth and on the enconnent alignant on sustainable development? 40 1 3 10.220 0.238 0.2381 0.2381 0.2500 0.281 0.2500 0.281 0.262 <td>7</td> <td>Vill you know construction waste management rule is mention from ministry of environment?</td> <td>40</td> <td>1</td> <td>3</td> <td>18</td> <td>0.549</td> <td>0.302</td>	7	Vill you know construction waste management rule is mention from ministry of environment?	40	1	3	18	0.549	0.302
S Dopuse contruction vate margement agreent system or your sin? 40 1 3 18 DBM0 0.435 If harp usue a numerical provide on your sin? 40 1 3 15 DBM0 0.443 If harp usue a numerical provide numerical provide on your sin? 40 1 3 15 DBM0 0.413 ID base left on quality usproprodule material 40 1 3 11 0.038 DBM0 0.443 ID base left on quality usproprodule material product on the environmental inpact due to Contruction vate? 40 1 3 11 0.038 DBM0 0.443 ID provide inclusion and dendifyers an angement harsing to a statistic developmen? 40 1 3 12 DSM0 0.443 ID provide inclusion and dendifyers anagement harsing to a statistic developmen? 40 1 3 12 DSM0 0.443 ID provide inclusion and statistic indipactor cor? 40 1 3 12 DSM0 0.433 DSM0 0.435 DSM0 DSM0 DSM0 DSM0 DSM0 DSM0 DSM0<	8	Have you ever heard about the importance of recycling in construction industry?	40	1	3	17	0.679	0.461
D1 heap vouse any method to varie disposed Picophign series? 40 1 3 15 0.080 0.031 Description 40 1 3 17 0.550 0.338 Description 40 1 3 17 0.550 0.338 Description 40 1 3 17 0.550 0.338 Description and varies encorphismed on the enconcental inpact due to Contraction varie? 40 1 3 13 0.555 0.243 Dispositivity Connuction and dentifying varies any agreent inspace to sustainable development? 40 1 3 13 0.555 0.231 Dispositivity Connection and dentifying varies any agreent inspace to sustainable development? 40 1 3 13 0.028 0.388 0.388 0.388 0.388 0.388 0.388 0.388 0.388 0.388 0.388 0.388 0.388 0.388 0.388 0.388 0.388 0.388 0.388 0.388 0.388 0.388 0.388 0.388 0.388 0	9	Do you use construction waste management system on your site?	40	1	3	18	0.660	0.435
11 Dest effect on qualy using resplicit nates? 40 1 3 17 0.930 0.338 12 Dest effect on qualy using resplicit nates? 40 1 3 17 0.930 0.338 12 Dest effect on qualy using resplicit nates for a point cost? 40 1 3 11 0.0378 0.144 12 Dosus hink the sendy hind and own the encionent all mpact on sustainable developmen? 40 1 3 13 0.555 0.2371 12 Dosus hink the increase propriod on the encionent all mpact on sustainable developmen? 40 1 3 13 0.553 0.2371 12 Dosus hink to increase propriod on the encionent all mpact on sustainable developmen? 40 1 3 13 0.553 0.2381 12 Dosus hink to increase propriod on the encionent propert cord? 40 1 3 13 0.523 0.523 13 Dosus hink index graves and kind on dubbe encient propert cord? 40 1 3 13 0.723 0.523 13 Dosus hink index graves and kind on dubbe encient propert cord? 40 1 3 16 0.555	10	Have you use any method for waste disposal or Recycling material?	40	1	3	15	0.640	0.41
CDex con-banelia analysis after the project cost? 40 1 3 11 0.0378 0.141 CD power indication and endormatic about the endormeral injust che to Construction vase? 40 1 3 11 0.0378 0.141 CD power indication and endormatic about the endormeral injust che to Construction vase? 40 1 3 12 0.0538 0.257 Constructions and endormatic mature anagement has impact on sustainable development? 40 1 3 12 0.0530 0.268 Constructions and endormatic mature anagement has impact construction vase? 40 1 3 12 0.0530 0.268 Constructions and endormatic intervalue anagement has effect on project con? 40 1 3 10 0.723 0.523 Place construction wate management has effect on project con? 40 1 3 17 0.067 0.40 1 3 16 0.526 0.257 Dopowink incomment has effect on project con? 40 1 3 14 0.675 0.458 0.255 0.257 0.458 0.255	11	Does it effect on quality using recycled material?	40	1	3	17	0.580	0.336
12 Drouwhin Keer serup/metanion about the environmentalingant dues (Construction vase? 40 1 3 13 0.055 0.271 12 Drouwhin Komunoton addentidring vaste magneent has impact on sustainable developmen? 40 1 3 13 0.055 0.243 12 Drouwhin Komunoton addentidring vaste vastainable developmen? 40 1 3 13 0.055 0.243 12 Drouwhin Komunoton addentidring vaste vastainable developmen? 40 1 3 13 0.058 0.243 13 Drouwhin korp development and development on? 40 1 3 13 0.058 0.253 13 Drouwhin korp development and development on? 40 1 3 13 0.058 0.253 13 Drouwhin korp development and development on? 40 1 3 13 0.058 0.253 13 Drouwhin korp development and development on? 40 1 3 13 0.058 0.253 13 Drouwhin korp and another helphane starge of maneial construction on the analysis induct bother barring construction on the analysis induct bother barring construction on thelphane starge of maneial construction on the analysis induct both	12	Does cost-benefit analysis affect the project cost?	40	1	3	11	0.379	0.144
M Doputifiel Contraction and denoising sate management fractingation subtainable developmen? 40 1 3 13 0.610 0.443 IS Carposite for the increase project conduction by the during of ensate? 40 1 3 12 0.530 0.281 IS Doputified conserving sates or and demonstraining fee sate? 40 1 3 12 0.530 0.281 ID Doputified conserving sates or and demonstraining fee sate? 40 1 3 13 0.938 0.348 ID Doputified conserving sates or and demonstraining fee sate? 40 1 3 13 0.938 0.253 ID Doputified conserving sates or and double minimated (Contruction Varies in marged proper)? 40 1 3 13 0.938 0.253 ID Doputifiel not environmental sates and satis double for balance and constraint? 40 1 3 16 0.554 0.257 ID toputifiel not environmental sates and satis double for balance and docreases the sates and analys? 40 1 3 16 0.554 0.257 ID install affort nationary sates and anadula docreases the sates and analys? 40	13	Do you think there is enough information about the environmental impact due to Construction waste?	40	1	3	19	0.545	0.297
ECompositive to revese project productivity by relacing and elimiting fer a stes? 40 1 3 12 0.0530 0.281 ED provide in domesting areas can decrease the project cost? 40 1 3 13 0.0530 0.381 ED provide in domesting areas can decrease the project cost? 40 1 3 13 0.0530 0.381 TD provide indegrepoid nearable sett to subgrapest cost? 40 1 3 13 0.0520 0.381 Table costsuction wate management have effect on project cost? 40 1 3 15 0.778 0.522 Disprovide incloader bearts analysis outdow on bearbeare asting construction? 40 1 3 14 0.655 0.271 Disprovide incloader bearts analysis outdow areating of naterial a decrease? 40 1 3 14 0.655 0.871 Disprovide incloader productivity of and decreases the watages of naterial a? 40 1 3 15 0.766 0.550 Disprovide incloader productivity of and decreases the watages of naterial a? 40 1 3 15 0.76	14	Do you think Construction and demolishing waste management has impact on sustainable development?	40	1	3	13	0.670	0.449
BD Document Provide Notation AU 1 3 13 0.028 0.348 D by outhink untgreuple material banefit free tradipoper cord? 40 1 3 13 0.023 0.523 D by outhink untgreuple material banefit free tradipoper cord? 40 1 3 13 0.023 0.523 B Prace construction area transagement free composition cord? 40 1 3 13 0.023 0.523 D by outhink construction area transagement free compositions in that a coldbe minimated (Construction Vase is managed popel)? 40 1 3 17 0.683 0.252 D by outhink construction attages of material is devices attage construction 40 1 3 14 0.675 0.452 D by outhink construction attages of material is devices attage of material? 40 1 3 16 0.555 0.571 D bit and affect method by more attages of material? 40 1 3 16 0.556 0.571 D bit and affect method by out and decreases the resolutivity of val and decreases the resolutivity of val and decreases the resolutivity and decreases? 40 1<	15	Can you say that to increase project productivity by reducing and eliminating the wastes?	40	1	3	12	0.530	0.281
11 0.07.3 0.52.1 12 Dopublik ubrg expelemental benefitie tradproper con? 40 1 3 1.3 0.72.3 0.52.2 15 Brance construction are transgement have effect on project con? 40 1 3 1.5 0.7.7.8 0.52.2 12 Dopublik incomment sizes in harmonet discess in harm	16	Do you think by decreasing waste we can decrease the project cost?	40	1	3	13	0.588	0.346
Bit Incorporation wate management have effect complex cose? 40 1 3 15 0.76 0.52 B (pounder incorporation wate management have effect complex cose? 40 1 3 15 0.76 0.52 B (pounder incorporations and model to entrimodel Contruction Vians's managed properly? 40 1 3 13 0.544 0.252 D (pounder incorporations and incorporations)? 40 1 3 17 0.675 0.472 D (pounder incorporations) 40 1 3 14 0.675 0.455 22 (boyout end watering and south of hading? 40 1 3 16 0.556 0.271 21 (India allot motor production yearbage? 40 1 3 15 0.76 0.550 22 (India allot motor production yearbage? 40 1 3 15 0.76 0.550 23 (India allot motor production specification and water and indiancease costauction wate? 40 1 3 15 0.76 0.550 23 (India allot motor producallot modulate work? 40	17	Do you think using recycle material benefit the total project cost?	40	1	3	13	0.723	0.523
BD cyclushin loss en knoor of the stage of material? 40 1 3 13 0.053 0.252 DD cyclushin loss en knoor of the stage of material? 40 1 3 17 0.667 0.472 DD cyclushin loss revinned is analysis should be done before saring contraction? 40 1 3 17 0.667 0.472 DD cyclushin loss revinned is analysis should be done before saring contraction? 40 1 3 14 0.675 0.472 DD cyclushin loss revinned by a contraction of building? 40 1 3 16 0.055 0.271 D lot and elect meducing wastage? 40 1 3 15 0.776 0.555 SU lot and elect meducing wastage? 40 1 3 16 0.058 0.571 D lot and pluncing rown increase the productivy of val and decreases the wastage of material? 40 1 3 15 0.776 0.551 D lot being commution explicit care of a wastage of material? 40 1 3 15 0.774 0.51 D lot covich in lam exe and devale	18	Have construction waste management have effect on project cost?	40	1	3	15	0.716	0.512
20 Doputiel Costewells analysis should be done before starting construction? 40 1 3 17 0.867 0.472 21 Doputiel Costewells analysis should be done before starting construction? 40 1 3 14 0.657 0.458 22 Doputer the holding construction of building? 40 1 3 16 0.555 0.237 22 Ishar affect meducing variange? 40 1 2 12 0.445 0.573 23 Ishar affect meducing variange? 40 1 3 15 0.776 0.573 23 Ishar affect meducing variange? 40 1 3 15 0.776 0.573 25 Ishar affect meducing variange? 40 1 3 15 0.776 0.573 26 Doputer strainge of material on step induced work and hard also incoreaer construction varie? 40 1 3 15 0.774 0.51 27 Dipouter information step induced work and water in metricoreaer and table con curing? 40 1 3 <td>19</td> <td>Do you think most environmental issues in India could be minimized if Construction Waste is managed properly?</td> <td>40</td> <td>1</td> <td>3</td> <td>13</td> <td>0.543</td> <td>0.235</td>	19	Do you think most environmental issues in India could be minimized if Construction Waste is managed properly?	40	1	3	13	0.543	0.235
21 Doputihi by uing sutrantometinique variages of material of doceases? 40 1 3 14 0.055 0.657 22 (Doputihi by uing sutrantometinique variages of material of doceases? 40 1 3 16 0.055 0.657 23 (Diputi dividing variages) 40 1 3 16 0.055 0.054 24 (Diputi dividing variages) 40 1 3 15 0.074 0.055 25 (Diputi dividing variances) 40 1 3 15 0.776 0.550 25 (Diputi dividing variances) 40 1 3 15 0.776 0.550 26 (Diputi dividing variances) 40 1 3 15 0.776 0.550 26 (Diputi dividing variances) 40 1 3 15 0.774 0.51 27 (Diputi dividing variances) 40 1 3 13 0.648 0.421 28 (Doput hin minimesend dividing variances) 40 1 3 15 0.778 0.552 29 (Doput hin minim	20	Do you think Cost benefits analysis should be done before starting construction?	40	1	3	17	0.687	0.472
22 Doyuwa new kenhodogi no compution di buding? 40 1 3 16 0.055 0.271 21 bitar affecti meduring variange? 400 1 2 12 0.405 0.274 21 bitar affecti meduring variange? 400 1 2 12 0.405 0.174 22 bitar affecti meduring variange? 400 1 3 15 0.766 0.555 25 bitar bitaring to main increase the poductivity of variand decreases the varianges of material? 400 1 3 16 0.0988 0.731 25 Disos decritical andphinting voli increase the enol? 400 1 3 15 0.774 0.511 27 Dispose traces after analesian set exolocated the satages of material? 400 1 3 15 0.774 0.511 20 Dispose think using PMC over tackional method decreased the ratages of material? 400 1 3 15 0.778 0.552 20 Dispose think using PMC over tackional method decreased the ratages of material? 400 1 3 15 0.766 0.552 20 Dispose think usin	21	Do you think by using automation technique vastages of material is decreased?	40	1	3	14	0.675	0.456
22 Ontal Metri Intelucing wastage? 40 1 2 12 0.445 0.054 0.054 0.054 0.054 0.054 0.054 0.054 0.054 0.054 0.054 0.054 0.054 0.054 0.054 0.054 0.054 0.053 0.056 0.053 0.076 0.055 0.076 0.055 0.076 0.055 0.076 0.055 0.076 0.051 0.076 0.051 0.076 0.051 0.076 0.051 0.076 0.051 0.076 0.051 0.076 0.051 0.076 0.051 0.076 0.051 0.076 0.051 0.076 0.051 0.076 0.051 0.076 0.051 0.076 0.051 0.076 0.051 0.076 0.051 0.076 0.051 0.078 0.060 0.071 0.052 0.070 0.051 0.052 0.070 0.052 0.070 0.052 0.076 0.052 0.076 0.052 0.076 0.052 0.076 0.052 0.076	22	Do you use new technology for construction of building?	40	1	3	16	0.545	0.297
24 [b] gaing propertiating to maximizenese the podulohity of wolf and decreases the natages of naterial? 40 1 3 15 0.776 0.553 25 [b] following contruction segment decreases of the natages of naterial? 40 1 3 16 0.088 0.753 26 [b] following contruction segment decreases of the natages of naterial? 40 1 3 15 0.774 0.051 27 [b] proper storage of material on steredoed the natages of naterial? 40 1 3 13 0.648 0.421 28 [D] provide in an insean of steredoed the natages of naterial? 40 1 3 15 0.774 0.051 28 [D] provide in an insean of steredoed the natages of naterial? 40 1 3 15 0.774 0.051 28 [D] provide in anterial on steredoed the natages of naterial? 40 1 3 15 0.778 0.652 20 [D] provide in landing and decreased the result of naterial? 40 1 3 15 0.776 0.552 20 [D] provide in landing and decreased the result of naterial? 40 1 1 10	23	Is that affect in reducing wastages?	40	1	2	12	0.405	0.164
25 [Uncloaking contruction tegrind backed level at dhe all astroneses construction wate? 40 1 3 15 0.088 0.731 26 [Dece electrical and plumbing volit nonese the revol? 40 1 3 15 0.74 0.51 27 [Dispose traces and the reade of the standard of the	24	By giving proper training to mason increase the productivity of work and decreases the wastages of material?	40	1	3	15	0.716	0.513
20 Does electrical andplunting work increases thereen ok? 40 1 3 15 0.714 0.51 27 Dyopose strange of material on biere located free strategies of material? 40 1 3 13 0.648 0.427 28 Dyoput him main reason diserely cases a breazure of interportable beam reinforcement and fabrication ruting? 40 1 3 15 0.718 0.642 28 Dyoput him main reason diservase is becaused interportable beam reinforcement and fabrication ruting? 40 1 3 15 0.778 0.552 20 Dyoput him using PMC our traditional method doeseed the value of interparts 40 1 3 15 0.776 0.552 30 Illow, doy use Crossinction rute management system on your site to torease the productivity and decreasing the cost 40 1 1 10 0.000 0	25	Not following construction step induced rework and that also increase construction waste?	40	1	3	16	0.868	0.753
27 By proper storage of material on site-seloced the variages of material? 40 1 3 13 0.048 0.427 28 Dop within hims measord sele variable beam reinforcement and fabrication running? 40 1 3 15 0.178 0.668 28 Dop within kins resord sele variable beam reinforcement and fabrication running? 40 1 3 15 0.178 0.652 20 Dop within kins report constrained method decreased the variable? 40 1 3 15 0.178 0.552 20 Doy with kins report constrained method decreased the variable? 40 1 3 15 0.152 20 Doy with kins report constrained method decreased the variable? 40 1 3 15 0.522 20 Doy with kins report constrained repart constrained report constr	26	Does electrical and plumbing work increase the rework?	40	1	3	15	0.714	0.51
28 Doyov. Inhimain reason diseelvaste is because di responsable beam reinforcement anditativation ruting? 40 1 3 15 0.718 0.603 25 Doyov. Inhin using PMC over tadional method decreased the varie of material? 40 1 3 15 0.776 0.552 30 Nov. do you use Construction varies management system on your site to increase the productivity and decreasing the cost 40 1 1 10 0.000 D	27	By proper storage of material on site reduced the vastages of material?	40	1	3	13	0.648	0.421
23 Doyouthinkusing MPC over traditional method becreased the waste of material? 40 1 3 15 0.776 0.552 30 [Nov, do you use Construction vaste management system on your site to increase the productivity and decreasing the cost 40 1 1 10 0.000 0	28	Do you think main reason of steel waste is because of irresponsible beam reinforcement and fabrication outting?	40	1	3	15	0.783	0.613
30 Nov, do you use Construction waste management system on your site to increase the productivity and decreasing the cost 40 1 1 1 10 0.000 0	29	Do you think using RMC over traditional method decreased the vaste of material?	40	1	3	15	0.716	0.512
	30	Nov, do you use Construction waste management system on your site to increase the productivity and decreasing the cost	40	1	1	10	0.000	0





Figure: Data View

 Image: Construction
 Description
 <thDescriptio

Fig: Mean & Deviation

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Figure: Output File

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	Name	Туре	Width	Decimals			Label			Values	Missing	Columns	Align	Measure	Role
1	Sr.No	Numeric	8	0	Sr.no					None	None	8	≣Right	🖉 Scale	∑ input
2	Name	String	8	0	NAME					None	None	8	≣Let	🔒 Nominal	🖌 input
3	A	Numeric	8	0	Have you hear	d about Con	struction Wa	este managen	ent?	None	None	8	≣ Right	💧 Nominal	V Input
4	В	Numeric	8	0	Are you aware	of waste ma	anagement ir	1 your area?		None	None	8	≣ Right	💧 Nominal	🖌 input
5	С	Numeric	8	0	Do you ever n	oticed Const	iuction waste	e in the road,	public area and	None	None	8	疆 Right	🌡 Nominal	🖌 input
6	D	Numeric	8	0	In India, Do yo	u thing Cons	struction was	ite managemi	nt is good?	None	None	8	≣ Right	\delta Nominal	🖌 input
1	E	Numeric	8	0	Do you know l	ndia recycle	just one per	cent of its co	nstruction and d	None	None	8	≣ Right	뤙 Nominal	🖌 input
8	F	Numeric	8	0	Do you thing (Construction	waste mana	gement is ne	essary?	None	None	8	≣ Right	🔒 Nominal	🖌 input
9	G	Numeric	8	0	Wil you know	construction	n waste man	agement rule	is mention from	None	None	8	疆 Right	🌡 Nominal	🖌 input
10	H	Numeric	8	0	Have you ever	heard about	the importan	nce of recyclin	g in constructio	None	None	8	🖩 Right	\delta Nominal	🖌 input
11	1	Numeric	8	0	Do you use co	instruction w	iaste managi	ement systen	on your site?	None	None	8	≣ Right	💰 Nominal	🖌 input
12	J	Numeric	8	0	Have you use	any method	for waste dis	sposal or Rec	cling material?	None	None	8	≣ Right	🔒 Nominal	🖌 input
13	K	Numeric	8	0	Does it effect	on quality us	ing recycled	material?		None	None	8	≣ Right	🌡 Nominal	🖌 input
14	L	Numeric	8	0	Does cost-ber	nefit analysis	affect the pr	roject cost?		None	None	8	🖩 Right	🌡 Nominal	🖌 input
15	М	Numeric	8	0	Do you think t	here is enou	gh informatio	in about the e	nironmertal imp.	None	None	8	≣ Right	🌡 Nominal	🖌 input
16	N	Numeric	8	0	Do you think (Construction	and demolis	hing waste m	anagement has i	. None	None	8	≣ Right	👌 Nominal	🖌 input
17	0	Numeric	8	0	Can you say t	hat to increa	ise project pr	roductivity by	educing and eli	None	None	8	≣ Right	🌡 Nominal	👌 input
18	P	Numeric	8	0	Do you think b	y decreasin	g waste we o	can decrease	the project cost?	None	None	8	🖩 Right	🌡 Nominal	🖌 input
19	Q	Numeric	8	0	Do you think u	using recycle	e material ber	nefit the total	project cost?	None	None	8	疆 Right	🌡 Nominal	🖌 input
20	R	Numeric	8	0	Have construc	tion waste m	nanagement	have effect or	project cost?	None	None	8	≣ Right	💧 Nominal	🖌 input
21	S	Numeric	8	0	Do you think n	nost environ	mental issue	s in India cou	d be minimized i.	. None	None	8	≣ Right	💧 Nominal	🖌 input
22	T	Numeric	8	0	Do you think (Cost benefits	analysis sh	ould be done	before starting c	None	None	8	疆 Right	뤙 Nominal	🖌 input
23	U	Numeric	8	0	Do you think b	oy using auto	mation tech	nique wastag	is of material is	None	None	8	≣ Right	💧 Nominal	🖌 input
24	V	Numeric	8	0	Do you use ne	ew technolog	y for constru	ction of build	ng?	None	None	8	≣ Right	💧 Nominal	🖌 input
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Figure: Variable View

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INTERNATIONAL JOURNAL OF ADVANCE SCIENTIFIC RESEARCH & ENGINEERING TRENDS

Multidisciplinary Journal

Double-Blind Peer Reviewed Refereed Open Access International Journal

Frequency Table

	Name	Type	Width	Decimals	1	Label		Values	Mesing	Columns	Align	Measure	Role
1	Sr.No	Numeric	1	0	Sr.no			None	None	1	Right	/ Scale	> Input
2	Name	String	8	0	NAVE			None	None	8	E Let	🗸 Nominal	> Input
	A	Numeric	8	0	Have you h	ward about Construction Waste m	anagement?	None	None	8	Rght	& Nominal	> Input
	8	Numeric	8	0	Are you av	are of waste management in your	area?	None	None	E	Rght	& Nominal	Y input
	C	Numeric	8	0	Do you we	a noticed Construction waste in th	noad mubic area and	None	None	8	Right	A Nominal	> Input
	0	Numeric	8	0	in india, D	😫 Frequencies)	X pre	8	Right .	& Nominal	N Input
	E	Numeric	8	0	Do you kr		Manager and	planestone	pne	8	Rght	& Nominal	> Input
6	F	Numeric	8	0	Do you th	A Description	Vanadee(s).	gadistics.	014	8	Reft	& Nominal	N input
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)	Q	Numeric	8	0	Do you this	vk using recycle material benefit th	e lotal project cost?	None	None	8	a Right	& Nominal	> input
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1	S	Numeric	8	0	Do you this	ik most environmental issues in In	dia could be minimized i	None	None	1	Right 8	💰 Nominal	> Input
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	٧	Numeric	8	0	Do you use	e new technology for construction o	of building?	None	None	8	Right	& Nominal	> input
		Remits			In the second	a la malacter medicana?		Here	11		-	0 Manipul	A 144.6

Have you heard about Construction Waste management?

-		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	32	80.0	80.0	80.0
	2	8	20.0	20.0	100.0
	Total	40	100.0	100.0	

Are you aware of waste management in your area?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	28	70.0	70.0	70.0
	2	10	25.0	25.0	95.0
	3	2	5.0	5.0	100.0
	Total	40	100.0	100.0	

Do you ever noticed Construction waste in the road, public area and Land?

-		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	39	97.5	97.5	97.5
	3	1	2.5	2.5	100.0
	Total	40	100.0	100.0	

In India, Do you thing Construction waste management is good?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	17	42.5	42.5	42.5
	2	17	42.5	42.5	85.0
	3	6	15.0	15.0	100.0
	Tot al	40	100.0	100.0	

Pie Chart



CONCLUSION

ITS development based on the recognition of ITS advantages and need for harmonized development. The main reasons for ITS introduction are: improving safety, improving efficiency, reducing pollution and enabling interoperability between different systems.

To achieve the full potential of ITS, a careful systematic approach is required in the design and planning, development and implementation, which addresses the problems of user needs and benefits, system architecture and integration issues while at the same time giving due attention to other national and international medium and long-term objectives related to such issues as land use and regional planning, infrastructure design, transportation system management, and many other important areas that are directly or indirectly influenced as a result of ITS implementation.

The great potential offered by technologically and economically viable Intelligent Transportation System was quickly recognized as an efficient way to resolve many simple and complex transportation problems. Recent expectations in relation to this potential have suggested, for example, that ITS will lead to a reduction in road fatalities; a reduction in travel time; a reduction in traffic delays; and a reduction in city pollution.

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