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Traffic Accident System Analysis: Optimization and Interpretation of traffic studies using Pattern Search Recognition Case Studies

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Abstract – The management and control of traffic system using roadside controllers and intelligent vehicles is innovative technique for the design of highway system. The Intelligent Transportation Highway System is the design concept introduced to enhance safety, efficiency and many other vehicular as well as user characteristics of highways. This concept has introduced for the improved architectural layout of highway design and also helped in reducing the environmental effects of the vehicles running on the highways.

Apart from project aspects, this study is necessary from global business point of view also. Today, in this globalized business world, any company has to compete with competitors from throughout the globe. In such a situation, optimum usage of resources, according to one pre planned schedule, for the deliverance of an estimated output is an absolute necessity. This could only be done when a system of estimating the resource productivity subject to the project constrains is in place. The main aim of this project is studying resources required for highway construction and increases Resource Productivity in different condition. A detailed study and analysis of the resources' productivity in highway projects is absolutely essential for the prediction of production rate of any team / group and as a whole of a project team. Identification of the factors affecting the productivity of each of the resources along with formation of graphs, formulas and charts to estimate production is also essential for the easy going of the job of planning.

Keywords— Traffic, Pattern Search, Resource Productivity, Planning, Material Management, Cost, Accident

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I. INTRODUCTION

To execute such variable works in different phases of project, any big construction company has to keep artillery of various plants and equipment's supported by an army of skilled and semiskilled manpower. In highway projects, the total project corridor is usually divided into sections and further to sub-sections for the ease of working and resource allocation.

The resources are generally allocated to the working teams groups on the basis of their productivity level and total volume of work allotted to the respective teams. Any disparity in the expected level of output compared to actual output level could lead to untimely completion and cost overrun and actually indicate improper prediction of the productivity level leading to wrong estimation of production rate.

For the above reasons, it is quite necessary to study the productivity of the different resources in detail for highway sector. The same equipment's and sometimes evens the same manpower being used in different activities, a detailed study, categorization and analyses of productivity of resources for different activities are very necessary. Identification of the factors affecting the productivity of each of the resources along with formation of graphs, formulas and charts to estimate production is also essential for the easy going of the job of planning.

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 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.

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.

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, time bound 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 man-hours 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.

II. PROBLEM STATEMENT

To study different resources like Material, equipment, Man-power required for a highway project also studying productivity in different conditions. For detailed study finding out the factors controlling the productivity of each resources and comparative study with different resources and it becomes Intelligent Transportation System.

Aim of Project

This study aims recognition and Interpretation of traffic accident system analysis on road accidents using Pattern Search through mathematical Model

Objectives

This study will be conducted based on several objectives which are:

- To reduce costs in dense traffic conditions as well as handling networked intersections
- To investigate the practical Issues of on-going Projects to resolved efficiently.
- This approach was implemented in real life with low cost; however, involves an error probability in data acquisition and use of sensory equipment.
- To precisely understand the advantages and disadvantages of the proposed design principle and of those of the model for route selection with the estimated personality
- Study identified the following challenges: need to place greater emphasis and study on core characteristics development efficient methods,
- To study Parameters like traffic regulation, noise pollution, fast response, and ITS of City VRP, development efficient methods, more research that focus on the interests of stakeholders, and the need for new City VRP benchmark data sets or problems

Methodology

- To classify traffic signs which are based on using pattern search of candidate object's vertices with standard traffic sign shapes.
- The method is fast because only vertices of candidate object were processed instead of comparing each and every pixel for recognition which reduced recognition time.
- It is invariant to translation, and a simple way is introduced to make it scale invariant. The method shows high robustness and high classification rate
- Efficient road-transportation strategies have recently become a very active research area. Efficient transportation of visitors to/from highly congested sites is one of the

most important challenges addressed by ITS.

► To Examines the influences exerted by network-correlations at intersection-points, and secondly, presents case-study evacuation scenarios examined under varying circumstances and flow requirements within each segment of the modelled network

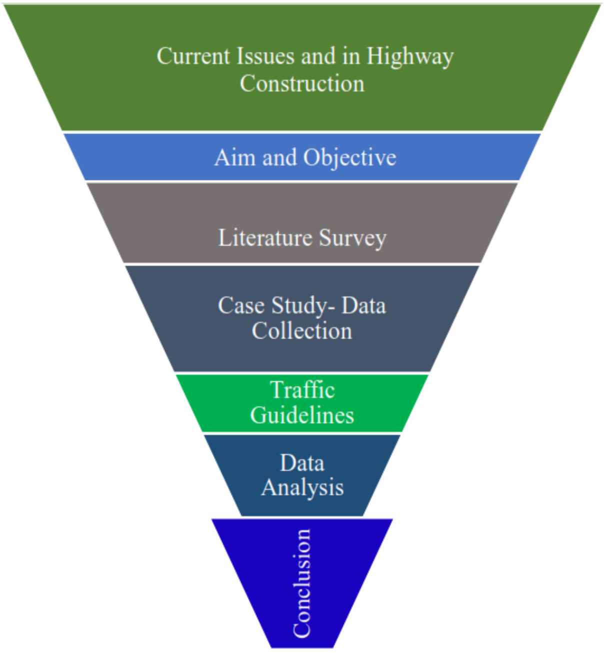


Figure1.1: Flowchart of Methodology

During the site visits, relevant data regarding the expenses and production rates of different resources used in the sites was collected. After collecting the data, different factors affecting the production rate of those resources was identified and their effects on the production were found out Collected data were put under a detailed comparative study and analysis of the data collected from various geographically located sites will be used to find out the interrelation among the factors.

The factors that are expected to be influencing the equipment production rate are geographical factors like height of construction, topography etc, environmental conditions, materials of construction, nature of activity, operator's efficiency etc. On the other hand, the human resource productivity was likely to be affected by working and living conditions, social-economic factors etc. After the analyses, efforts were put to find the trend of the factors on the productivity and also build the charts and graphs representing the trends. Finally, a trend of estimating the productivity of a resource in a given particular condition was developed the graphs, charts etc.

III. THEOROTICAL CONTENT

Proposed Work

Configuration of Traffic Control System A traffic control system largely consists of (i) information collection infrastructure, (ii) information-processing 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.

Information Collection Systems

The information collection infrastructure collects information on traffic conditions, weather conditions, etc. As for the method of collecting information on traffic conditions, a vehicle detector is employed in many cases for collecting information on traffic volume, speed, and occupancy levels. The following infrastructure have come to be used more often in recent years: probe cars capable of continuously collecting information on traffic conditions, imaging sensors capable of detecting unexpected incidents and license plate readers capable of directly measuring required travel times,. As a side note, the method for collecting information on required travel times by utilizing EFC's information on time when a vehicle passes through a tollgate has been put to practical use in Japan. In addition, it is recommended to install weather sensors such as rain gauges to cope with the spate of recent "guerrilla rainstorms" (localized torrential rains), and flood meters in locations that tends to be submerged by floods, such as underpasses. It is possible to promptly obtain information on disabled vehicles or falling objects on roads by installing emergency telephones and CCTV monitors at regular intervals along roads. Furthermore, in order to optimally control the entire road network, it is recommended to collect information on adjacent expressways and ordinary roads that run parallel to expressways, from other road managers.

4.1.2 Information-processing Systems

The information-processing infrastructure processes a vast amount of information provided by the information collection infrastructure, evaluates the levels of traffic congestion, prioritizes information that needs to be provided to the information provision infrastructure, and processes the content of information to be provided. In recent years, systems have been developed to provide road users with information on projected traffic conditions by analyzing real-time traffic conditions and past trend data. On the metropolitan expressways in Japan, a road information board displays not only information on traffic congestion (such as traffic-congested zones and length of traffic congestion) but also information on trends in changes in traffic congestion.

4.1.3 Information Provision Systems

The information provision infrastructure provides information processed by the information-processing infrastructure to road users. Road information boards and highway radio applications are commonly used as the information provision infrastructure. A road information board provides more specific information, such as information on areas where there is traffic congestion or traffic is regulated and the length of traffic congestion. If there are wide-area detour routes available to avoid traffic congestion, it is recommended that a graphic road information board be installed to provide road users with information that enables them to visually understand traffic conditions and available alternative routes and decide on optimal routes which suit them. Currently, information for personal computer (PC) compatible or Internet-compatible mobile phones and smartphones is also provided to road users via the Internet. In addition, it is possible to provide more detailed information to road users by installing a large display road information board or an interactive road information kiosk in expressway rest areas, which is a computer terminal that provides road information to road users. Road-to-vehicle communication systems such as IVI or ITS Spot are utilized as a means of providing information to road users while they are driving. This information includes wide-area roads and comparisons on the number of available routes, amongst other information. It is recommended this information be provided to road users to assist in their effective use of road networks.

Communications Systems

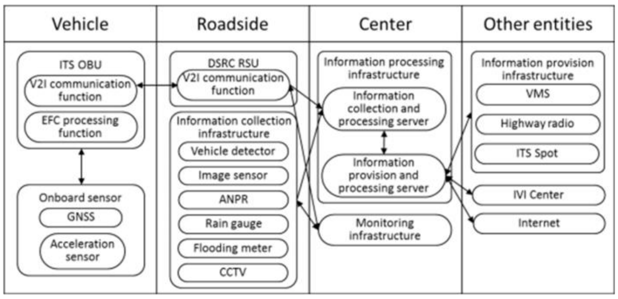
The communications infrastructure connects the information collection infrastructure and the information provision infrastructure, both of which are installed roadside, to the information-processing infrastructure, which is installed at a road manager's traffic control center or similar. In Japan, such a connection is often made via wire communication (optical fiber or exclusive line). In recent years, optical fibers have been more extensively used because they are superior in terms of communication capacity and scalability. In cases where roads are newly constructed, it is more efficient to install the communications infrastructure concurrently. If it is difficult to newly install a wired communication network for costs and other reasons, it is possible to use an Internet connection as a virtual private network (VPN) connection or use radio communication networks, provided that, as such methods are inferior to an exclusive wired communication line in terms of reliability, it is necessary to fully compare and review all the available methods.

Monitoring Systems

The monitoring infrastructure displays and monitors a variety of information, such as road traffic conditions collected by the information collection infrastructure, the results of information processing conducted by the information-processing infrastructure and the status of information provision. In many cases, the monitoring infrastructure consists of a large monitor display unit and an operation console. In recent years, the method of displaying a simplified route map showing road routes under control and their traffic conditions in a monitor display unit in an easy-to-understand manner has become a favoured method.

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:

- 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;
- 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:

- Framework ITS Architecture;
- Mandated ITS Architecture;
- Service ITS Architecture,

Framework Architecture, most suitable for national level architecture, focuses on user needs and functional viewpoint. This type of architecture can be also considered as a starting point for the development of other two types of architecture. Mandated Architecture consists of physical, logical and communication viewpoints but also includes additional outputs.

Content of Mandated Architecture is strictly defined and, as a consequence, choices for deployment options are limited. Service Architecture is similar to Mandated Faculty of Transport and Traffic Sciences Intelligent Transport Systems. Architecture, but includes services. Additionally, there are also physical and logical architecture.

While the logical architecture consists of processes and interconnecting data flows, physical architecture includes physical components (parts of equipment) and related data flows. ITS architecture can live to its potentials only when logical architecture is based on user needs, vision and operational concept, and when physical architecture is developed based on the logical architecture. Defining the physical architecture is strongly connected with standardization and implementation strategy.

Functional Area and services in the field of ITS Initial standardization of ITS services, focused on road transport, was set up by ISO (International Standardization Organization). First reference model for ITS included functional areas and the reference models for ITS architecture were improved, describing ITS Fundamental Services, replaced standards presented in Technical Report on Transport Information and Control Systems. Intention of new taxonomy is to relate similar and complementary ITS services. The taxonomy includes 11 functional areas:

- ♦ Traveller Information
- ♦ Traffic Management and Operations
- ♦ Vehicles
- ♦ Freight Transport
- ♦ Public Transport
- ♦ Emergency
- ♦ Transport Related Electronic Payment
- ♦ Road Transport Related Personal Safety
- ♦ Weather and Environmental Monitoring
- ♦ Disaster Response Management and Coordination
- ♦ National Security

Data collection

Hardware: sensors, cameras, GPS

Data type: traffic count, surveillance, speed and time, location, vehicle weight, delays etc.

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Data Transmission

Rapid and real-time data transmission between the road and Traffic Management Center

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Data Analysis

Error rectification, data cleaning, data synthesis and adaptive logical analysis

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Data Transmission

Rapid and real-time data transmission between the Traffic Management Center and the traveller

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Intelligent Information

Real-time information like travel time, travel speed, delay, accidents on roads, change in route, diversions, work zone conditions etc. delivered by a wide range of electronic devices like variable message signs, highway advisory radio, internet, SMS, automated cell.

4.2 Data Analysis

An integral part of the National Programme is appropriate measures, which ensure more effective implementation of priority activities and some of the planned projects. They were established on the basis of defined national strategic objectives and European and national priority areas. At the time of their defining period, the experience of the past development of ITS in Croatia, and some of the European experience were used.

The following measures have been proposed within the priority areas:

1. Optimal use of road, traffic and travel data; Faculty of Transport and Traffic Sciences

- Establishment of free access to and a market of real-time traffic and travel data, which will enable access to this information to interested service providers in this area.
- Defining procedures for optimal use of and access to map-related road data
- Preparation of guidelines for the provision of multimodal traffic information in Croatian cities and regions
- Implementation of advanced systems of pre-travel and travel information and traffic management in larger Croatian cities
- Preparation of guidelines for implementation of ITS applications and services in tourist locations on the Adriatic

2. Continuity of Intelligent transport systems services in traffic and freight management;

- Development of the National ITS framework architecture
- Defining the organisational model for the National (Road) Traffic Management Centre and the corresponding business models
- Development of the national system and procedures for traffic management in emergency situations 3. ITS road safety and security applications;
- Establishment of an information system with data concerning road traffic safety and security free of charge to end users
- Implementation of the motorway safety management system
- Establishment of the Call system in Croatia Faculty of Transport and Traffic Sciences
- Establishment of the system of information services for safe and secure parking places for trucks and commercial vehicles and the corresponding reservations system
- Launching research projects from the field of road safety management Research on the road safety local characteristics.
- Establishment of the National centre for operator training for traffic management and traffic incident management

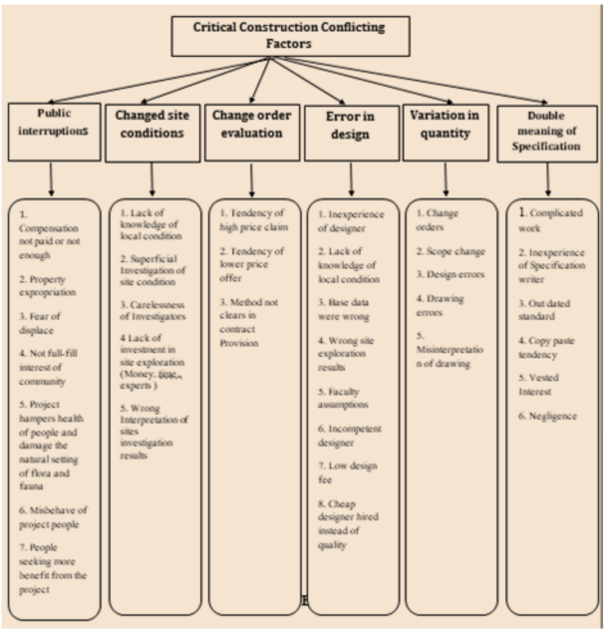
4. Linking the vehicle with the transport infrastructure

- Launching of the national programme for the monitoring of application of cooperative systems in road traffic in the European Union
- Launching of research projects from the field of cooperative systems

5. National priority areas

- Development of financing models for the establishment of particular ITS solutions
- Promotion of public-private partnership in the field of implementation of ITS solutions in Croatia
- Measures for stimulating the R&D sector in the field of ITS
- Improvement of the road telematics equipment maintenance as an important part of the ITS
- Development of efficient lifelong learning in the field of ITS for different users
- Strengthening the coordination between key stakeholders in the field of ITS

During the site visits, relevant data regarding the expenses and production rates of different resources used in the sites was collected. After collecting the data, different factors affecting the production rate of those resources was identified and their effects on the production were found out Collected data were put under a detailed comparative study and analysis of the data collected from various geographically located sites will be used to find out the interrelation among the factors. The factors that are expected to be influencing the equipment production rate are geographical factors like height of construction, topography etc, environmental conditions, materials of construction, nature of activity, operator's efficiency etc. On the other hand, the human resource productivity was likely to be affected by working and living conditions, social-economic factors etc. After the analyses, efforts were put to find the trend of the factors on the productivity and also build the charts and graphs representing the trends. Finally, a trend of estimating the productivity of a resource in a given particular condition was developed the graphs, charts etc.



The best dispute management skill is the ability to stay out of dispute not as an avoidance technique but rather, as specific prevention strategy. Three key areas to manage are:

Clear specifications

Writing a specification that will be interpreted the same way by different people is a skill that takes years to acquire. In a dispute, it does not matter what was meant, only what is in the contract.

An independent specification review should find and correct material ambiguities. Unfortunately, most organizations do not conduct such reviews and find out later, after the contract has been put into operation, that the specification should have been much, much clearer.

Clear communication protocols

Internal policies and procedures regarding communication, approvals, signoffs and the like, have no bearing in a dispute unless incorporated into the contract and made an obligation of the parties. Consider the number of people who might have a discussion, some form of correspondence, or even just contact with anyone in the other party – there will be quite a few people acting with presumed authority and inadvertently committing your organization. Have clear internal processes, authorities, forms and the like, incorporate them into the contract and make them binding on both parties.

Proactive issue management

It is not unusual, in a contract of reasonable size and complexity, to have up to 300 unresolved issues at any given time; they can quickly grow into disputes if the environment is right. Before declaring something a dispute, consider managing it as an issue, at least to begin with.

Defining a problem an ‘issue’ rather than a ‘dispute’ has a big impact. You can apply normal project management techniques to issue management. Have a mechanism for anyone to raise an issue track and assign all issues, and have regular issue resolution meetings.

Attributes:

1	Lack of surveillance
2	Failure of contributors to instantly handle changes
3	variations in legislation and guidelines
4	Lack of understanding
5	Incompetent designer
6	Poor communications among project contributors
7	Lack of cooperation among contributors
8	Indistinct contract documents
9	Impracticable expectations by the parties
10	The impact of local culture.
11	Misinterpretation of contracts
12	Lack of resources
13	Poor communication and documentation
14	Late involvement of lawyers in the construction projects
15	Tendency of lower price offer
16	Working relations and Supervision
17	Circumstances produces a model based on project uncertainty
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 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.

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.

Ranking 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	Ranking
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

Ranking of factors of working tools and object

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 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)]
- ► 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)

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.

The respondents were asked to indicate the positions they held in the respective companies and the duration for which the company is in operation. They were provided with options to choose from. About 26.7% of the respondents who participated in the study are from Top management background, 40% were from middle management, while 33.3% were serving as a lower management as shown in the Fig. These respondents are well conversant with effect of traffic management.

Questions:

1. Have you heard about traffic Management?
2. Are you aware of traffic management in your area?
3. Do you ever notice traffic in the road, public area and Land?
4. In India, Do you thing traffic management is good?
5. Do you know India traffic just one per cent of our city?
6. Do you thing traffic management is necessary?
7. Will you know traffic management rule is mention from ministry of India?
8. Have you ever heard about the importance of traffic pattern search technique?
9. Have you use any method for traffic reduction?
10. Does it effect on common people?
11. Does cost-benefit analysis affect the project cost?
12. Do you think there is enough information about the impact due to traffic?
13. Do you think traffic management has impact on sustainable development?
14. Do you think by decreasing traffic we can decrease?
15. Do you think using traffic technique to reduced and benefit the total cost?
16. Have traffic management have effect on development?
17. Do you think most environmental issues in India could be minimized if traffic is managed properly?
18. Do you think Cost benefits analysis should be done before starting management of traffic?
19. Do you think by using pattern search technique to decrease traffic?
20. Do you use new technology for traffic management?
21. Is that affect in reducing traffic using different Techniques?
22. By giving proper training to mason increase the liability of work and decreases the traffic?
23. Not following construction step induced rework and that also increase construction waste?
24. Does electrical work increase the rework?
25. By proper storage of material on site reduced the wastages of material?
26. Do you think main reason of traffic is because of irresponsible?
27. Now, do you use traffic management to increase the productivity and decreasing the cost of project?

Highway Details:

The State Highway Traffic police have identified more than 45 spots on National Highway which are major accidental prone zones. Statistics have revealed that a total number of 1,169 accidents were reported on Mumbai-Banglore highway which ended up killing 307 people in 2016.

- According to data, total number of accidents occurred due to traffic signals involves 15,125 accidents, 4,322 killed and 12,995 injured.
- One serious roads accidents in the country occurs every minutes and 16 dies on Indian roads every hour.
- About 1214 road crashes occurs every day on India.

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 Project	98.717 Km
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
Independent	M/s. SA Infrastructure Consultants Pvt. Ltd. In

Engineer	Association with Dhruv Consultancy Services Pvt.Ltd.
Project Management Assistant	M/s. Sowil Limited
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 Concession Agreement	03rd March 2014
Appointed date	21st January 2015
Scheduled Four-Laning Date	910th (nine hundred and tenth) day from the Appointed date (18.07.2017).
Concession Period	29 Years Commencing from the Appointed Date.

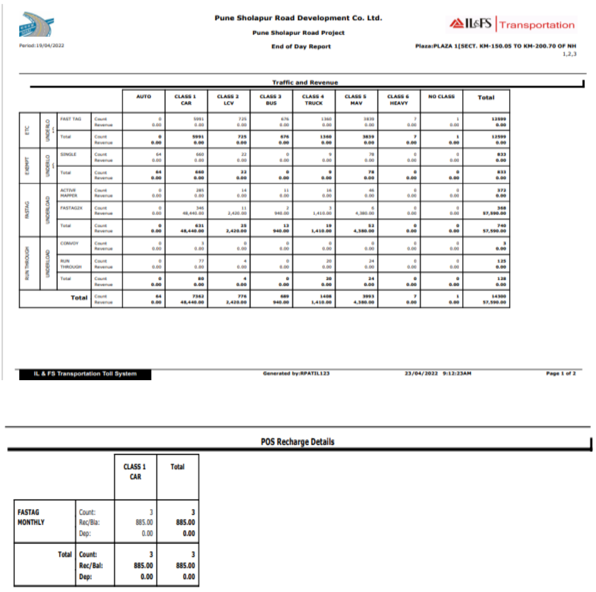
SITE PHOTOS:

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 Underpasses	1

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
5	Pedestrian / Cattle Underpasses	11
6	Box Culverts	11
7	Pipe Culverts	123

RESULT AND DISCUSSION



Pune Sholapur Road Development Co. Ltd.
Pune Sholapur Road Project
End of Day Report
Period:19/04/2022
IL&FS Transportation
Plaza:PLAZA 1[SECT. KM-150.05 TO KM-200.70 OF NH 1,2,3

Traffic and Revenue

				AUTO	CLASS 1 CAR	CLASS 2 LCV	CLASS 3 BUS	CLASS 4 TRUCK	CLASS 5 MAV	CLASS 6 HEAVY	NO CLASS	Total
ETC	UNDERLOAD	FAST TAG	Count	0	5991	725	676	1360	3839	7	1	12599
			Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	Count	0	5991	725	676	1360	3839	7	1	12599
			Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EXEMPT	UNDERLOAD	SINGLE	Count	64	660	22	0	9	78	0	0	833
			Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	Count	64	660	22	0	9	78	0	0	833
			Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FASTAG	UNDERLOAD	ACTIVE MAPPER	Count	0	285	14	11	16	46	0	0	372
			Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		FASTAG2X	Count	0	346	11	2	3	6	0	0	368
			Revenue	0.00	48,440.00	2,420.00	940.00	1,410.00	4,380.00	0.00	0.00	57,590.00
		Total	Count	0	631	25	13	19	52	0	0	740
			Revenue	0.00	48,440.00	2,420.00	940.00	1,410.00	4,380.00	0.00	0.00	57,590.00
RUN THROUGH	UNDERLOAD	CONVOY	Count	0	3	0	0	0	0	0	0	3
			Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		RUN THROUGH	Count	0	77	4	0	20	24	0	0	125
			Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	Count	0	80	4	0	20	24	0	0	128
			Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total			Count	64	7362	776	689	1408	3993	7	1	14300
			Revenue	0.00	48,440.00	2,420.00	940.00	1,410.00	4,380.00	0.00	0.00	57,590.00

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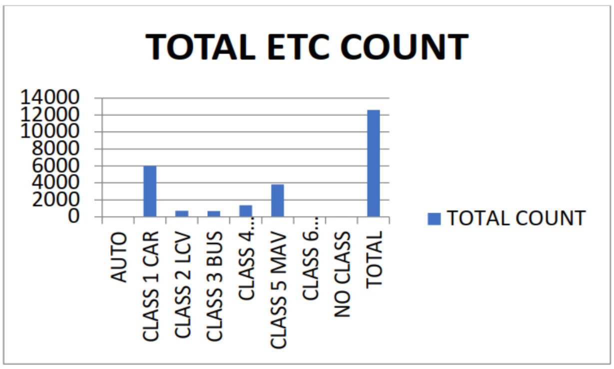
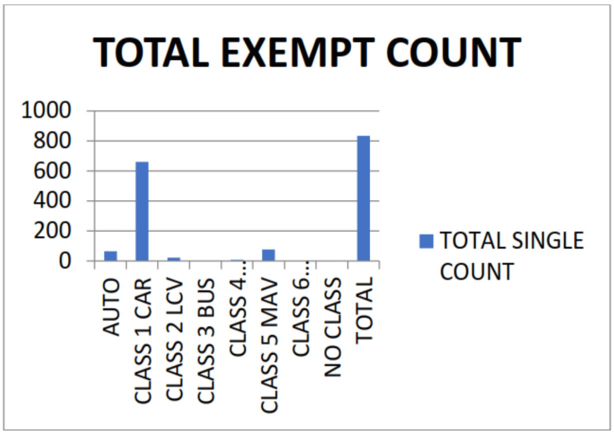
POS Recharge Details

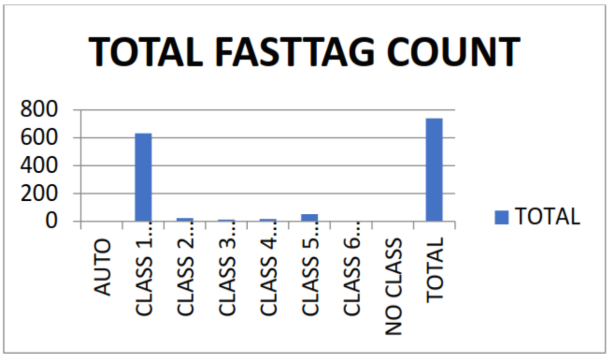
		CLASS 1 CAR	Total
FASTAG MONTHLY	Count:	3	3
	Rec/Bla:	885.00	885.00
	Dep:	0.00	0.00
Total	Count:	3	3
	Rec/Bal:	885.00	885.00
	Dep:	0.00	0.00



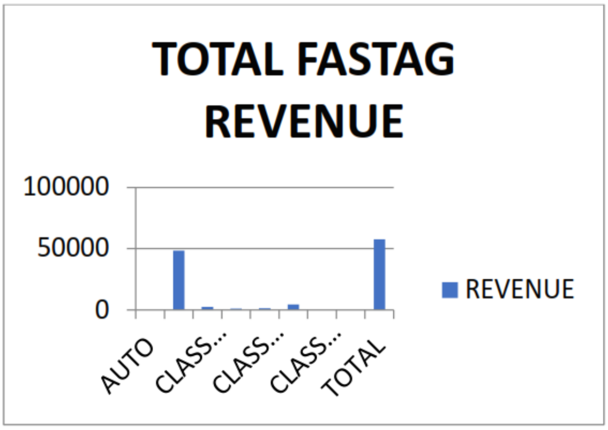
Graph: total ETC count with zero revenue.



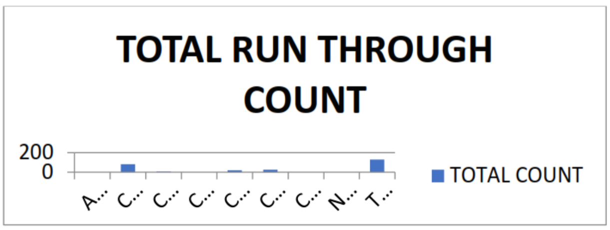
Graph: total EXEMPT count with zero revenue.



Graph: total Fast tag count



Graph: total Fas tag Revenue



Graph: total run through count with zero revenue.

Pune Sholapur Road Development Co. Ltd.

Pune Sholapur Road Project

End of Day Report

Period:20/04/2022

Plaza:PLAZA 1[SECT. KM-150.05 TO KM-200.70 OF NH 1,2,3

Traffic and Revenue

				AUTO	CLASS 1 CAR	CLASS 2 LCV	CLASS 3 BUS	CLASS 4 TRUCK	CLASS 5 MAV	CLASS 6 HEAVY	NO CLASS	Total
ETC	UNDERLOAD	FAST TAG	Count	0	5960	731	676	1466	4306	5	0	13144
			Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	Count	0	5960	731	676	1466	4306	5	0	13144
			Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EXEMPT	UNDERLOAD	SINGLE	Count	64	667	33	1	4	66	0	0	835
			Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	Count	64	667	33	1	4	66	0	0	835
			Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FASTAG	UNDERLOAD	ACTIVE MAPPER	Count	0	201	7	8	10	28	0	0	254
			Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		FASTAG2X	Count	0	362	15	1	6	2	0	0	386
			Revenue	0.00	50,680.00	3,300.00	470.00	2,820.00	1,460.00	0.00	0.00	58,730.00
		Total	Count	0	563	22	9	16	30	0	0	640
			Revenue	0.00	50,680.00	3,300.00	470.00	2,820.00	1,460.00	0.00	0.00	58,730.00
MANUAL	NORMAL	SINGLE	Count	0	0	0	0	1	0	0	0	1
			Revenue	0.00	0.00	0.00	0.00	130.00	0.00	0.00	0.00	130.00
		Total	Count	0	0	0	0	1	0	0	0	1
			Revenue	0.00	0.00	0.00	0.00	130.00	0.00	0.00	0.00	130.00
RUN	UNDERLOAD	RUN THROUGH	Count	0	70	7	0	2	13	0	1	93
			Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	Count	0	70	7	0	2	13	0	1	93
			Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total			Count	64	7260	793	686	1489	4415	5	1	14713
			Revenue	0.00	50,680.00	3,300.00	470.00	2,950.00	1,460.00	0.00	0.00	58,860.00

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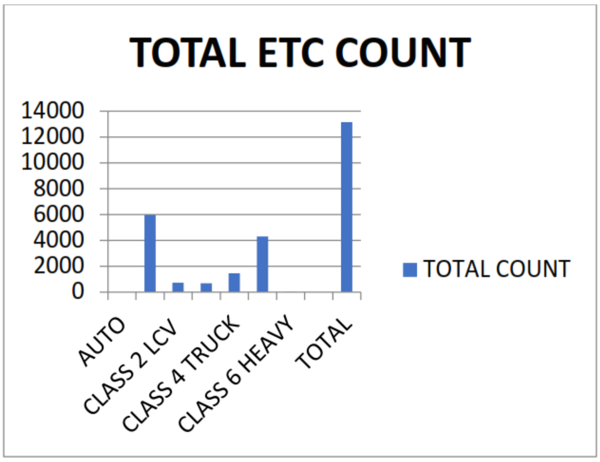
Period:20/04/2022

End of Day Report

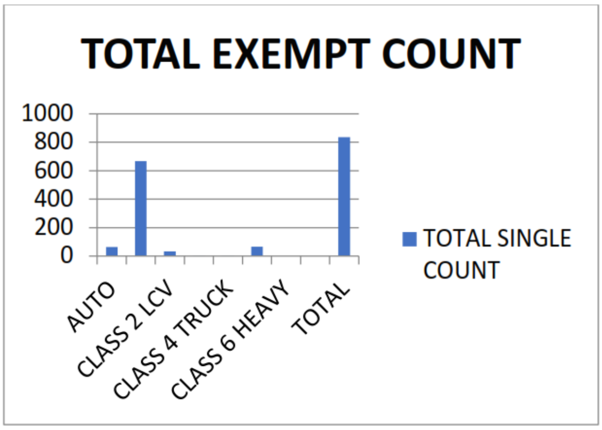
Plaza:PLAZA 1[SECT. KM-150.05 TO KM-200.70 OF NH 1,2,3

POS Recharge Details

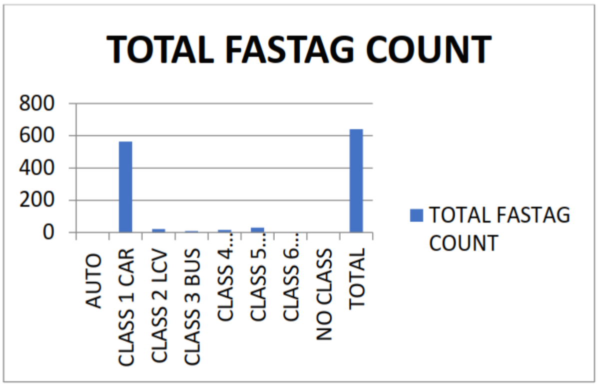
		CLASS 1 CAR	Total
FASTAG MONTHLY	Count:	3	3
	Rec/Bla:	915.00	915.00
	Dep:	0.00	0.00
Total	Count:	3	3
	Rec/Bal:	915.00	915.00
	Dep:	0.00	0.00



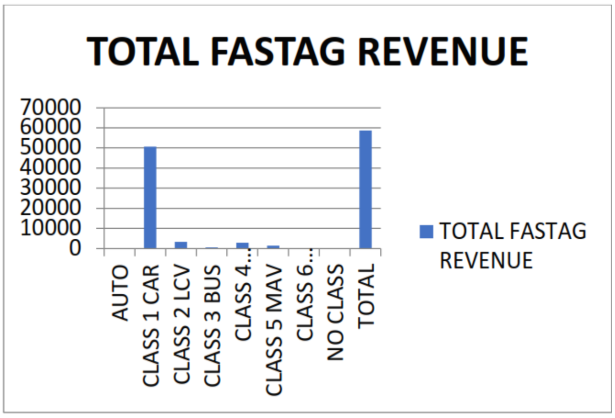
Graph: total ETC count with zero revenue.



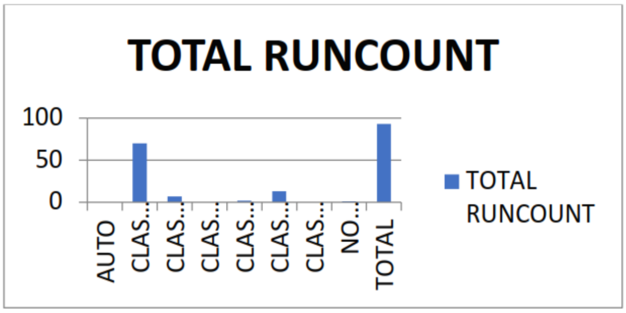
Graph: total EXEMPT count with zero revenue.



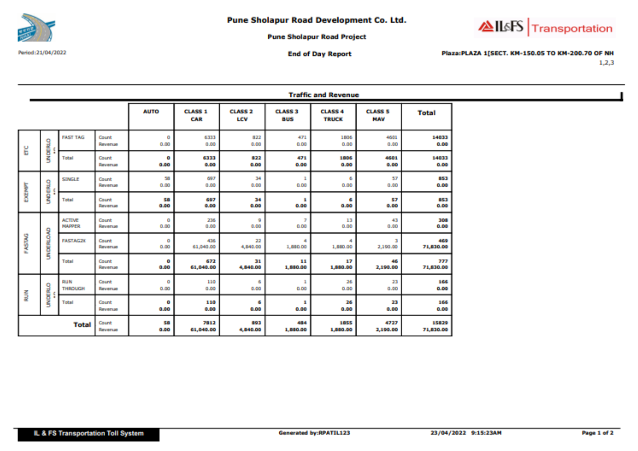
Graph: total Fastag count.



Graph: total Fastag revenue.



Graph: total run count with zero revenue.



Pune Sholapur Road Development Co. Ltd.

Pune Sholapur Road Project

End of Day Report

IL&FS Transportation

Period:21/04/2022

Plaza:PLAZA 1[SECT. KM-150.05 TO KM-200.70 OF NH 1,2,3

Traffic and Revenue

				AUTO	CLASS 1 CAR	CLASS 2 LCV	CLASS 3 BUS	CLASS 4 TRUCK	CLASS 5 MAV	Total
ETC	UNDERLOAD	FAST TAG	Count	0	6333	822	471	1806	4601	14033
			Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	Count	0	6333	822	471	1806	4601	14033
			Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EXEMPT	UNDERLOAD	SINGLE	Count	58	697	34	1	6	57	853
			Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	Count	58	697	34	1	6	57	853
			Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FASTAG	UNDERLOAD	ACTIVE MAPPER	Count	0	236	9	7	13	43	308
			Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		FASTAG2X	Count	0	436	22	4	4	3	469
			Revenue	0.00	61,040.00	4,840.00	1,880.00	1,880.00	2,190.00	71,830.00
		Total	Count	0	672	31	11	17	46	777
			Revenue	0.00	61,040.00	4,840.00	1,880.00	1,880.00	2,190.00	71,830.00
RUN	UNDERLOAD	RUN THROUGH	Count	0	110	6	1	26	23	166
			Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	Count	0	110	6	1	26	23	166
			Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total			Count	58	7812	893	484	1855	4727	15829
			Revenue	0.00	61,040.00	4,840.00	1,880.00	1,880.00	2,190.00	71,830.00

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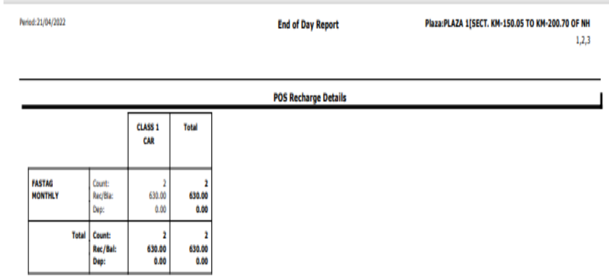


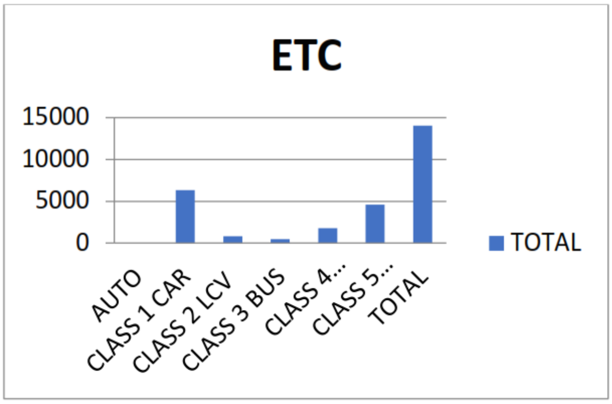
Period:21/04/2022

End of Day Report

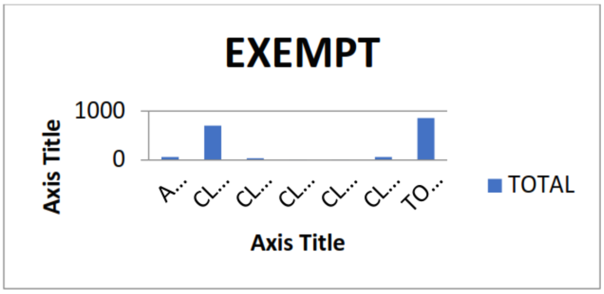
Plaza:PLAZA 1[SECT. KM-150.05 TO KM-200.70 OF NH 1,2,3

POS Recharge Details

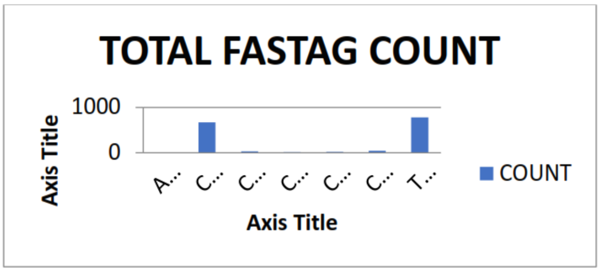
		CLASS 1 CAR	Total
FASTAG MONTHLY	Count:	2	2
	Rec/Bla:	630.00	630.00
	Dep:	0.00	0.00
Total	Count:	2	2
	Rec/Bal:	630.00	630.00
	Dep:	0.00	0.00



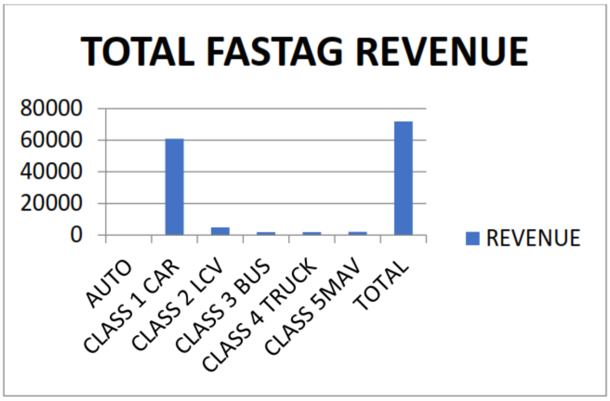
Graph: total ETC count with zero revenue.



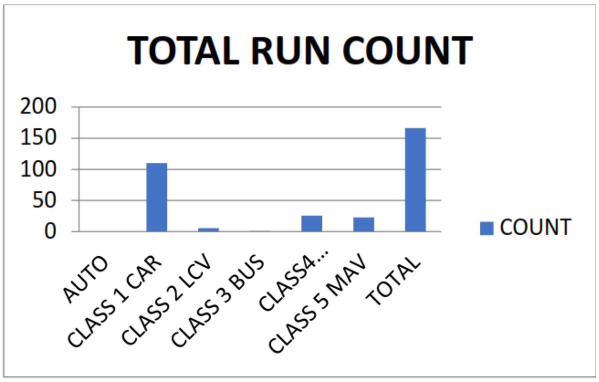
Graph: total EXEMPT count with zero revenue.



Graph: total Fastag count.



Graph: total Fastag revenue.



Graph: total run count with zero revenue.

Pune Sholapur Road Development Co. Ltd.

Pune Sholapur Road Project

End of Day Report

Period:22/04/2022

IL&FS | Transportation

Plaza:PLAZA 1[SECT. KM-150.05 TO KM-200.70 OF NH 1,2,3

Traffic and Revenue

				AUTO	CLASS 1 CAR	CLASS 2 LCV	CLASS 3 BUS	CLASS 4 TRUCK	CLASS 5 MAV	CLASS 6 HEAVY	NO CLASS	Total
ETC	UNDERLOAD	FAST TAG	Count	0	6563	697	1211	1002	4647	2	0	14122
			Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	Count	0	6563	697	1211	1002	4647	2	0	14122
			Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EXEMPT	UNDERLOAD	SINGLE	Count	62	727	30	1	11	52	0	0	883
			Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	Count	62	727	30	1	11	52	0	0	883
			Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FASTAG	UNDERLOAD	ACTIVE MAPPER	Count	0	216	13	7	6	38	0	0	280
			Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		FASTAG2X	Count	0	466	20	3	6	1	0	0	496
			Revenue	0.00	65,240.00	4,400.00	1,410.00	2,820.00	730.00	0.00	0.00	74,600.00
		Total	Count	0	682	33	10	12	39	0	0	776
			Revenue	0.00	65,240.00	4,400.00	1,410.00	2,820.00	730.00	0.00	0.00	74,600.00
MANUAL	NORMAL	SINGLE	Count	0	0	0	0	0	1	0	0	1
			Revenue	0.00	0.00	0.00	0.00	0.00	80.00	0.00	0.00	80.00
		Total	Count	0	0	0	0	0	1	0	0	1
			Revenue	0.00	0.00	0.00	0.00	0.00	80.00	0.00	0.00	80.00
RUN THROUGH	UNDERLOAD	CONVOY	Count	0	1	0	0	1	0	0	0	2
			Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		RUN THROUGH	Count	0	62	4	0	11	27	0	1	105
			Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	Count	0	63	4	0	12	27	0	1	107
			Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total			Count	62	8035	764	1222	1037	4766	2	1	15889
			Revenue	0.00	65,240.00	4,400.00	1,410.00	2,820.00	810.00	0.00	0.00	74,680.00

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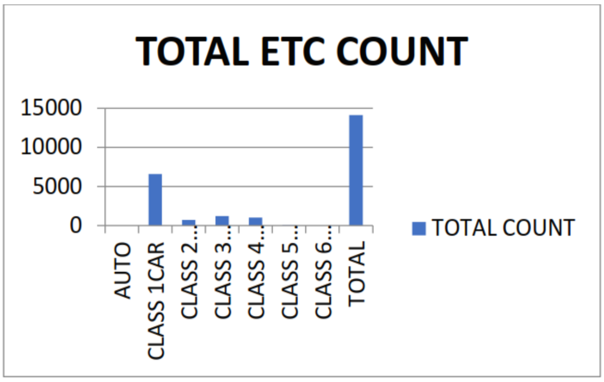
Period:22/04/2022

End of Day Report

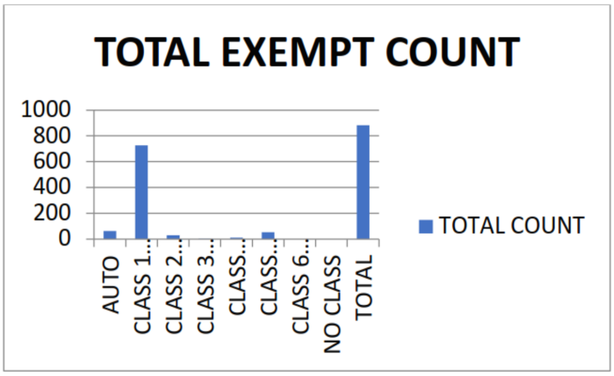
Plaza:PLAZA 1[SECT. KM-150.05 TO KM-200.70 OF NH 1,2,3

POS Recharge Details

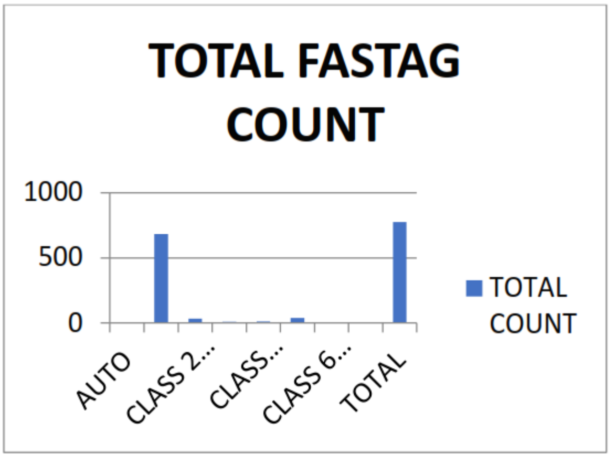
		CLASS 1 CAR	Total
FASTAG MONTHLY	Count:	1	1
	Rec/Bla:	315.00	315.00
	Dep:	0.00	0.00
Total	Count:	1	1
	Rec/Bal:	315.00	315.00
	Dep:	0.00	0.00



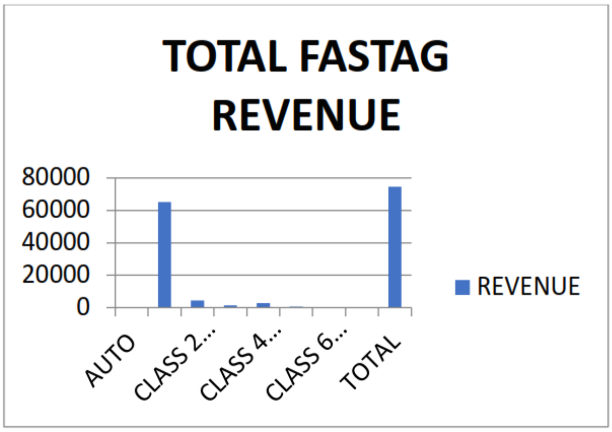
Graph: total ETC count with zero revenue.



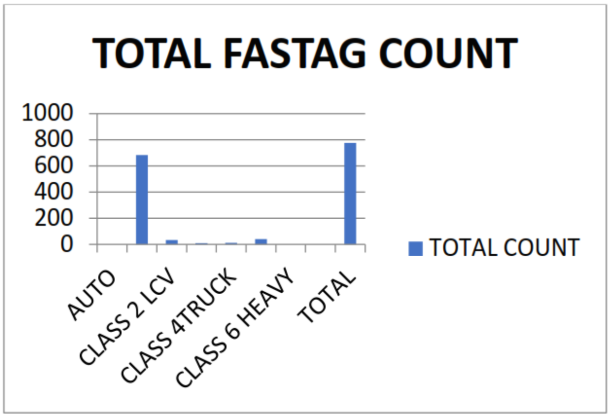
Graph: total EXEMPT count with zero revenue.

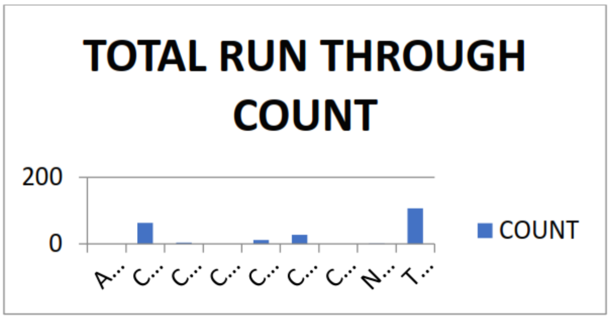


Graph: total Fastag count.



Graph: total Fastag revenue.





Graph: total run count with zero revenue.

CONCLUSION

- The purpose of our investigation was to see if the GPS traffic data set obtained through the Map My Run web service is sufficient for inferring temporal usage patterns of street segments in relation to traffic flow.
- Our findings demonstrate that such an analysis is doable, but only within certain parameters.
- When compared to the GPS data set's permanent traffic counting stations, our findings provide a good ground truth for the proposed research.
- We were able to stress a temporal analysis that allowed us to examine the internal city traffic and the incidence of congestion in detail.
- We found clusters with distinct consumption trends over time. The visual examination of these clusters revealed that shopping and recreational activities, in particular, have a distinct temporal utilization pattern.
- Demonstrated that temporal patterns cannot effectively discriminate between consecutive activities the use of access roads, for example, is intimately linked to the use of residential neighborhoods, where individual movements often begin and conclude.
- Third, the clustering revealed that the weekend is the most distinctive time period for distinguishing usage patterns.
- By tweaking our clustering process, we were able to identify groups with comparable temporal traffic distributions, and we interpreted the results using temporal and spatial background knowledge.
- As a result, we were able to produce a unique and extensive analysis for the which we were able to clearly identify traffic patterns associated to specific road segments flow
- We were able to connect and receive data from a major traffic route service and a digital map supplier.

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