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Highway Safety Project Evaluation Methodologies comparisons with world class techniques

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ABSTRACT:

The objective of this project was to develop and present techniques which would be useful in the evaluation of highway safety countermeasures programs conducted by local and state agencies. Systems analysis techniques were used to organize the evaluation process and to develop its components in a logical manner. The report includes a chronological overview of the program formulation, implementation and evaluation process, program modelling techniques, material on I experimental design, cost-effectiveness analysis, anti the application of these evaluative methods to four OHSP programs.

The project is to develop and present techniques which are useful in the evaluation of "action" projects conducted by local and state agencies. Throughout this study, we have used the techniques of systems analysis to organize the evaluation process and to develop the components of this process in a logical manner, Without such a systems approach, the evaluator is left with no unified way to consider project proposals.

INTRODUCTION:

Freeway programming involves a process of deciding on and scheduling improvement initiatives on the groundwork of the relative urgency of the work. A key detail of method is the matching of wanted projects with to be had funds to accomplish the freeway improvement objectives throughout a given interval.

Approach objectives

Highway improvement pursuits can more commonly be grouped into 4 main classes: safety, service, and energy and

atmosphere. Reduction of advantage accidents is a foremost drawback in highway design and preservation. Because the function of a freeway method is to furnish provider to the public, improvement of the level of service is also an primary goal. Whilst, consideration need to accept to guard the capital funding already made in freeway facilities, and for this reason the upkeep of the physical condition becomes yet another most important goal. The subsequent important objective of freeway activities involves externalities, chiefly related to energy conservation and the discount of environmental pollution. The possible development and upkeep events are linked with these objectives by means of their impact on these bodily

factors that contribute to protection, service, , and power and environ- intellectual aspects. For instance, a reconstruction task would toughen the of the highway process by making improvements to the present serviceability index of the pavement and condition ranking of the constructions as good as other roadway appurtenances. Reconstruction projects would also have an effect on the extent of carrier if a lane is introduced or the lane width is increased or roadway geometry is elevated. In a similar fashion, the security aspect would also be extended if the undertaking integrated roadway or shoulder widening or the installation of security improvement appurtenances. It will have to be famous that a task may just affect the entire process pursuits, despite the fact that to a varying measure. Some tasks are primarily supposed for safeguard development, akin to geometric amendment and installation of site visitors safety instruments. Similarly, some projects are concerned typically with , reminiscent of resurfacing, while some are meant to strengthen service, corresponding to widening or geometric modification. Nonetheless, most highway projects affect all of the objectives to a exact extent. Capabilities in regards to the have an impact on of quite a lot of tasks on unique method pursuits just isn't special. Nevertheless, some data are to be had in the literature. For example, the safety influences of projects involving a change pavement width, shoulder width, and shoulder surface kind are documented in

NCHRP file 197 (1). Additionally, the safeguard influences of traffic operation and control contraptions are indicated in

NCHRP document 162 (2). Even though efforts are made to follow a rational process in highway programming strategies via evaluating the initiatives in terms of application pursuits there are various extraneous motives that may enter into the

approach. For illustration, a few of these explanations may just arise out of political commitments, some inspired by means of self curiosity, and others by way of honest differences of opinion on the relative importance of projects. Programming, for that reason, involves the art of mixing the suitable variables into an orderly system of task determination and implementation. NCHRP, file 48 summarizes the complete process in a 15-step process used to produce a possible application enabling for the complexities offered by the various variables which can be involved (three). The coronary heart of this procedure, nonetheless, is the environment of priorities, which might be-therefore used in allocating money amongst various competing projects.

Priority environment

on account that the quantity of dollars wanted to accomplish fundamental freeway tasks far exceeds the on hand cash, the allocation of assets amongst competing initiatives becomes the valuable predicament in the programming system. Precedence setting has hence been the most important aspect in freeway program administration. For instance, in California, a unique system is undertaken to advance priority lists for an annual State Transportation

development program (4). Despite the fact that the foremost method targets of security, carrier, and situation form the important criteria, there are lots of different technical and nontechnical, quantifiable and nonquantifiable standards that enter into the method of precedence environment (3). A assessment of those standards was presented in Sinha and Jukins (5). There are several approaches to atmosphere priorities for determining freeway development and maintenance projects. A system headquartered on sufficiency or deficiency scores has been in use for many many years in freeway programming. Nevertheless, this method will not be able of dealing explicitly with the quandary of the finest allocation of assets to maximize security effectiveness. There are a number of other strategies developed over the

earlier decades that have been in use within the system of challenge determination and price range allocation. Most of these strategies contain an estimation of venture charges and associated advantages to reach at a priority rating and score scheme. Before these procedures are discussed, it is major to examine the sort of expertise critical for making a safety evaluation of alternative initiatives.

Knowledge administration

For any amazing administration of highway development and upkeep packages, it's important to have an effective information-assortment and reporting procedure. The periodic monitoring of accidents earlier than and after a highway assignment is undertaken, along with know-how on task expenditures, is important to type a critical data base that can be used to make wise selections about future highway development and upkeep routine.

Accident information the fundamental data requirements include number of accidents by severity, time interval of accident occurrence, accident places, part lengths, traffic volumes, and freeway class. Information on the time of day, weather, type of accident, or different stipulations is also useful in some cases. The after data must also point out the sort of highway undertaking carried out. Accident information for a interval of at least two years before and after the mission implementation are integral to establish meaningful outcome.

On the groundwork of the gathered knowledge, the accident premiums for exact locations may also be computed as proven below:

For highway sections:

$$Number\ of\ Accidents\ per\ Million\ Vehicle\ Miles = \frac{(Number\ of\ Accidents)(10^6)}{(Section\ ADT)(Number\ of\ Days)(Section\ Length)} \quad (1)$$

For Intersections or spots:

$$Number\ of\ Accidents\ per\ Million\ Vehicle = \frac{(Number\ of\ Accidents)(10^6)}{(Location\ ADT)(Number\ of\ Days)} \quad (2)$$

The accident rates vehicle be developed via severity (deadly, nonfatal injury, and property-injury-handiest), if adequate data are on hand. Otherwise, accident information would comprise all accidents. As soon as the accident information are accumulated for a ample quantity of freeway sections or locations of identical geometric and visitors characteristics,

normal accident premiums can also be centered. An example of usual accident rates by way of highway style is given within the AASHTO handbook (6).

Project rate knowledge

Fee knowledge of individual initiatives will have to be recorded within the following classes: preliminary price, annual cost of preservation and operation, expected terminal price, service lifetime of a assignment, and the prevailing discount fee. In many instances, the task initial fees are available, while the rest of the know-how has to be estimated or assumed. In addition, in lots of circumstances, the tasks are implemented in a blend of a couple of venture forms, and it turns into intricate to separate the costs of 1 sort from the others included within the project. Careful definition of project types would get rid of this trouble. It will have to also be well-known that the mission expenditures would range tremendously via the place of the freeway and through the variety of freeway due to the fact that of the difference in roadway geometric and traffic stipulations. In the community gathered and compiled price information could be most appropriate. In the case where such expertise just isn't available, national average information can be used to make a method broad evaluation of highway applications.

Accident fee knowledge

In economic evaluation of growth projects, it is vital to assign cost values to accident

discount rates. Accident rate values are available via severity. Nevertheless, in general, it is not integral to take into account fatal, injury, and property damage accidents individually when computing accident expenditures (7). In California, it's recommended that if the share of fatal to harm to property-harm accidents on a targeted place is just not significantly special from the statewide typical, the accident expenses for all accidents are to be used with the sum of fatal plus non-fatal injury and property-

harm accidents. The statewide normal accident price figures for California are given in desk 1 (7). The most dependable data on accident fees would be those which were accrued locally. Nevertheless, probably such understanding is not simply on hand. Nationwide data are on hand from such firms because the national defense Council and the country wide highway site visitors security .

Different road materials used: The most important pavement materials are soils, mineral aggregates, bituminous binders, and stabilizers like lime, cement, etc. Mineral aggregates constitute about 90 percent of total volume of road construction materials used. All roads have to be founded on soil and are required to make optimum use of the locally available materials, if it is to be constructed economically. Materials used in the structural layers of the pavement should be selected based on availability, economy and previous experience.

Soil as road construction material: Sub grade soil is an integral part of the road pavement structure as it provides support to the pavement as its foundation. The main function of the sub grade is to give adequate support to the pavement and for this the sub grade should possess sufficient stability under adverse climatic and loading conditions. The formation of wave, corrugations, rutting and shoving in black top pavements are generally attributed to poor sub grade conditions. When soil is used in embankment construction, in addition to stability, incompressibility is also important as differential settlement may cause failure. Soil is used in its natural form (gravel and sand) or in a processed form (stabilized layer) for pavement construction. Soil is also used as a binder in water-bound macadam layers. Soil is therefore, considered as one of the principal highway materials. The foundation of other cross-drainage structures (culverts, bridges and retaining walls) rests on soils and their stability depends on the soil strength, knowledge of soil properties is necessary to select the embankment material, pavement structure, drainage system and foundation of structures. When a high embankment rests on soft ground, its stability can be predicted by studying the properties of soil. Frost action, common in high altitudes, can be taken care of if the soil properties are well known. Soil consists mainly of minerals matter formed by the disintegration of rocks, by the action of water, frost, temperature, and pressure or by plant or animal life. Based

on the individual grain size of the soil particles, soil have been classified as gravel, sand, silt, and clay. The BIS gives the following limits of particle size. Gravel 80-4.75 mm Sand coarse 4.75- 2.00 mm Medium 2.00-0.475 mm Fine 0.475-0.075 mm Silt 0.075- 0.002 mm Clay

Bituminous material: Bitumen is a viscous liquid, semisolid or solid material, colour varying from black to dark brown having adhesive properties consisting essentially hydrocarbons is derived from distillation of petroleum crude or natural asphalt and soluble in carbon disulphide. Bituminous materials used for paving purposes are penetration grade bitumen and liquid bitumen (cutbacks & emulsion). The bituminous binder should possess the following qualities. ¾ Adequate viscosity at the time of mixing and compaction. ¾ Not highly temperature susceptible. ¾ Should not strip from aggregate in presence of water.

Site clearance: General: Site clearing generally consists of the cutting and/or taking down, removal and disposal of everything above ground level, including objects overhanging the area to be cleared such as tree branches, except such trees, vegetation, structures or parts of structures and other things which are designated in the contract to remain or be removed by others to which the engineer directed to be left undisturbed. The material to be cleared usually but not necessarily is limited to trees, stumps, logs, brush, undergrowth, long grasses, crops, loose vegetable matter and structure. The entire road area shall be cleared as described above, unless otherwise shown on the drawing and/or directed by the engineer.

Setting out: The right of way (R.O.W) shall be surveyed and set out before any site clearance is cleared out. Wooden pegs usually indicate the surveyed rights of ways. Procedure for setting out: 1. Fixing of centre line of alignment by using total station, theodelite.

2. Calculating curvature and refractures(for curves and embankment) by using auto levels or dumpy level.

3. To establish traverse bench mark (TBM) at required intervals adjacent to alignments.

4. Location of levels at major conflict junctions.

5. To mark the longitudinal and cross sectional pavement structure.

6. To make efficient, minimum and desired sight distance at major conflicts and terrain and also setting out of horizontal curves throughout the alignment

was done by using theodolite and total survey station.

CONCLUSIONS :

The general objectives are for the Concession Company to make the main NH5 road [and the service roads] as safe as possible for all users. The Concession Company shall follow [and shall also show it has followed] all relevant Indian publications on road safety, especially The Manual for Safety in Road Design (A guide for Highway Engineers) prepared in September 1998 for MOST. A formalised safety audit procedure must be followed [to optimise the safety process, and ensure safety is properly and formally considered] by the Concession Company during the detailed design [and during the Construction and post construction periods].

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