

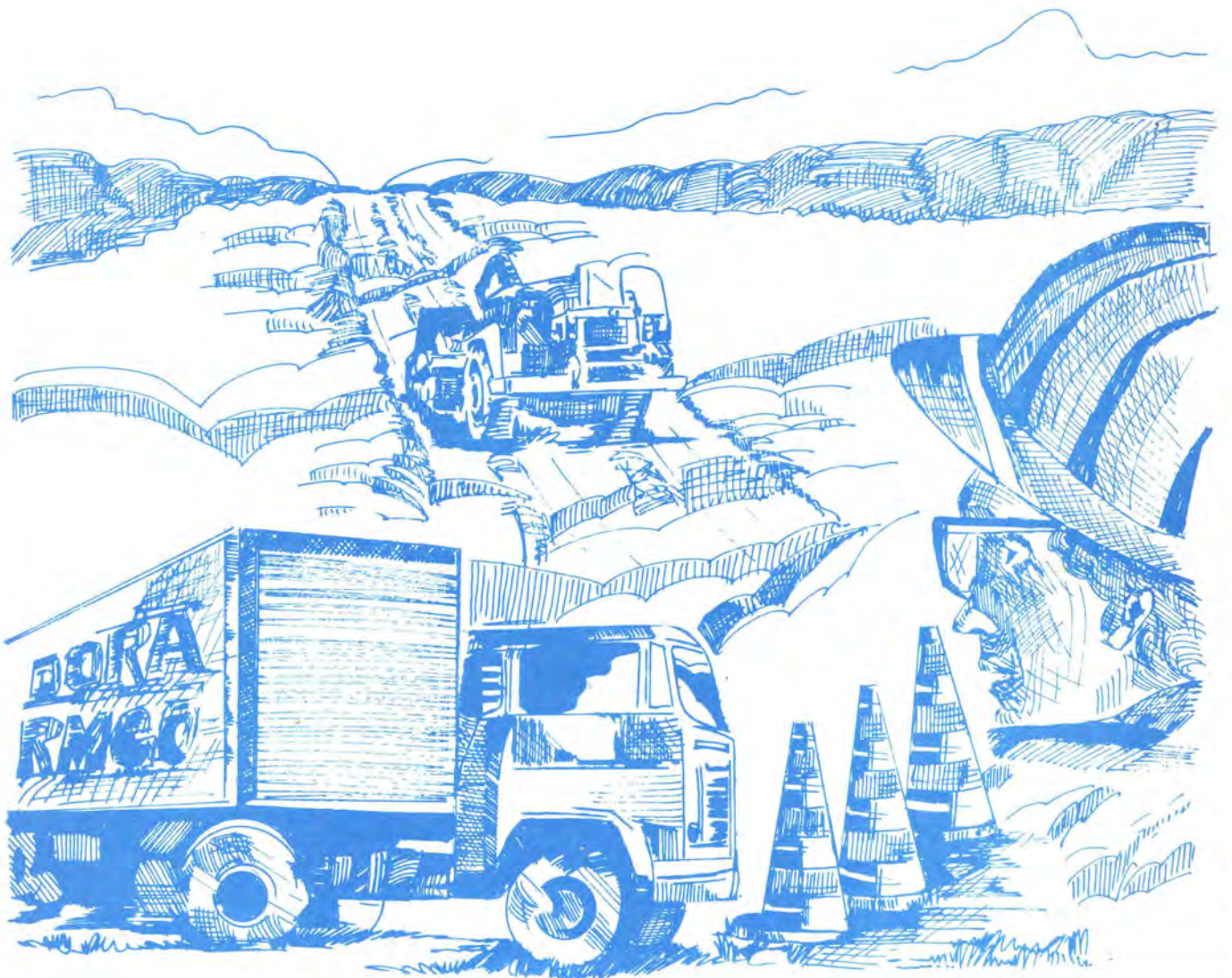
REPÚBLICA FEDERATIVA DO BRASIL

MINISTÉRIO DOS TRANSPORTES

United Nations Development Programme (UNDP)

Research on the Interrelationships Between Costs of Highway Construction, Maintenance and Utilization

Final Report - 1981



VOLUME 10 – MODEL FOR SIMULATING TRAFFIC (MST)

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MINISTÉRIO DOS TRANSPORTES

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**Research on the Interrelationships
Between Costs of Highway
Construction, Maintenance
and Utilization**

Final Report - 1981

SPONSORED BY:

MINISTÉRIO DOS TRANSPORTES

SECRETARIA DE PLANEJAMENTO DA PRESIDÊNCIA DA REPÚBLICA

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WITH THE PARTICIPATION OF:

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Conteúdo: v.1 Summary of the ICR Research v.2 Methods and organization v.3 Instrumentation v.4 Statistical guide v.5 Study of road user costs v.6 Study of vehicle behavior and performance v.7 Study of pavement maintenance and deterioration v.8 Highway cost model (MICR) v.9 Model of time and fuel consumption (MTC) v.10 Model for simulating traffic (MST) v.11 Fundamental equations v.12 Index to PICR documents.

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PREFACE

This research project was funded through an agreement signed in January, 1975 by the Brazilian Government and the United Nations Development Programme (UNDP). The Ministry of Transportation, acting through the Brazilian Transportation Planning Agency (GEIPOT), assumed the responsibility for the project on behalf of the Brazilian Government, and the International Bank for Reconstruction and Development (IBRD) acted as the executing agency for UNDP.

The research was carried out by GEIPOT and the National Highway Department (DNER), acting through its Road Research Institute (IPR). Funding from the Brazilian Government was channeled through the Institute for Economic and Social Planning (IPEA) and the Secretariat for International Economic and Technical Cooperation (SUBIN), along with the Ministry of Transportation.

The World Bank contracted the Texas Research and Development Foundation (TRDF) to organize the international technical staff and to select and purchase the imported equipment needed for the research. The participation of the TRDF continued until December of 1979.

This report is comprised of twelve volumes (each edited in both English and Portuguese) which summarize the concepts, methods and results obtained by December, 1981 by the project entitled "Research on the Interrelationships Between Costs of Highway Construction, Maintenance and Utilization (PICR)". It includes a documentary index volume which will aid researchers in locating topics discussed in this report and in numerous other documents of the PICR. This report contains much detailed analysis which is being presented for the first time, and also incorporates relevant parts of earlier reports and documents produced under the 1975 Agreement, updating them through the inclusion of new results and findings.

A special mention is due the Highway Departments of the States of Minas Gerais and Goiás, the Universities of Aston, Birmingham, Juiz de Fora, Minas Gerais and Texas, and the Western Australia Main Roads Department, which placed some of their best and most experienced personnel at the service of this project to fill many key positions on the research staff.

Finally, thanks are due the Transport and Road Research Laboratory for its assistance during the initial stages of the project, along with specialists from various countries who periodically visited Brazil to discuss the work being done in the PICR and to assist the permanent research staff in conducting analyses.

JOSÉ MENEZES SENNA
President

VOLUMES IN THIS REPORT*

- VOLUME 1 - SUMMARY OF THE ICR RESEARCH
- VOLUME 2 - METHODS AND ORGANIZATION
- VOLUME 3 - INSTRUMENTATION
- VOLUME 4 - STATISTICAL GUIDE
- VOLUME 5 - STUDY OF ROAD USER COSTS
- VOLUME 6 - STUDY OF VEHICLE BEHAVIOR AND PERFORMANCE
- VOLUME 7 - STUDY OF PAVEMENT MAINTENANCE AND DETERIORATION
- VOLUME 8 - HIGHWAY COSTS MODEL (MICR)
- VOLUME 9 - MODEL OF TIME AND FUEL CONSUMPTION (MTC)
- VOLUME 10- MODEL FOR SIMULATING TRAFFIC (MST)
- VOLUME 11- FUNDAMENTAL EQUATIONS
- VOLUME 12- INDEX TO PICR DOCUMENTS

* Volume 1 contains a brief description of the contents of each volume, while Volume 12 provides a subject index to this report and all other PICR documents, including technical memoranda and working documents.

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SUMMARY

The Model for Simulating Traffic (MST) is one of the products of the Research on the Interrelationships Between Costs of Highway Construction, Maintenance and Utilization (PICR). The Model simulates traffic flow on two-lane highway sections of any vertical and horizontal alignment complexity. This makes it possible to evaluate the impact of transportation policies and strategies, such as construction of a third (climbing) lane, construction of a highway intersection, or the introduction of new transportation technologies, such as that represented by the multitrailer ("road train"). The MST also makes it possible to compute travel times, operating speeds, fuel consumption and other data that can be used by the transportation planner in analyzing the effects of transportation policies and strategies.

The major purpose of the Model is to specify the relationships between both operating speed and fuel consumption, on one hand, and highway geometry, type of surface and roughness, on the other. This relationship may also be used in the Highway Planning Model, now being prepared by GEIPOT for the Ministry of Transportation, which seeks to define the relationships between the three components of highway transportation cost: highway construction, maintenance and utilization.

This document presents the second version of the MST, which is both more efficient and more complete than the first one. A third version of the MST, describing input data in greater detail, is expected to be completed soon.

The MST User's Manual is also available. This manual presents complete instructions for the codification of the input data and Model parameters, together with four examples of applications (present situation of the highway, introduction of a third lane, introduction of a transversal highway with a STOP sign, and the effect on traffic of the application of new technologies or vehicles, such as the multitrailer).

Finally, a Programmer's Manual has also been prepared, with the complete MST flow chart and the listing of the computer program.

