

A FURTHER STUDY OF
TRANSPORTATION PROBLEMS ON
SOUTH AFRICAN UNIVERSITY CAMPUSES

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A thesis presented in partial fulfilment of the requirements for the degree of MSc (Eng).

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May 1978

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ABSTRACT

This thesis surveys the transportation problems of universities in RSA, and solutions proposed thereto.

The transportation problems referred to are problems of —

- access to and egress from the campus ;
- internal circulation on the campus (whether of vehicles or pedestrians) ; and
- parking on the campus.

Universities were asked to rank in priority order a series of problem statements. Using their replies as a base, a questionnaire was drawn up, and was posted to all eleven White universities, plus the Universities of Durban-Westville and the Western Cape. Information requested included population figures in various staff/student and resident/commuter categories, parking demand and provision, modal split, public transport supply and use, and measures to cope with future increase in traffic. Despite a very satisfactory response, there remain gaps in the data, especially on the question of modal split.

Visits were paid to most of the universities ; planning and administrative staff were interviewed.

A comparison with a similar study, done in 1970/1971, yields information on trends. Particularly, it is encouraging to note the improvement in the scope and standard of transportation planning on some of the campuses.

Overseas information which could make a contribution to a better understanding of the RSA situation was gathered by means of a questionnaire survey and a literature survey. The countries selected for this purpose, by reason of the similarity of key socio-economic characteristics of their population to RSA data, were Australia, New Zealand and Canada. Additional information was gathered, by means of a limited literature survey and a few visits, from universities in UK and USA. This information was critically assessed on its applicability to RSA needs.

From this mass of information, factors that influence campus transportation problems are seen to emerge. In the light of this understanding, generalised solutions that are proposed from time to time for the transportation problems at particular universities are commented on in the thesis.

The need becomes clear for a carefully integrated package of solutions to be applied to the transportation problems of any campus ; manipulation of only one or two of the factors will certainly not be successful, and might even produce unexpected and undesired results.

It is also stressed that the unique character and circumstances of each campus must be appreciated before any solution derived from experience at other campuses, or from "average campus" circumstances, is contemplated.

Certain directions for further research are pointed out.

The Author hopes that the findings will prove very useful to university planning authorities in RSA.

Tables, figures and photographs illustrate the text.

ACKNOWLEDGEMENTS

This Thesis has been made possible through the co-operation of many people who gave generously of their time and knowledge. Their contributions included assistance with preparation of the questionnaire and covering letters; translation ; the completion of the questionnaires and provision of other information as requested ; typing, drafting and printing services ; and the review of manuscripts.

Particular thanks are due to :

- i) correspondents at the universities in South Africa and overseas ;
- ii) my thesis supervisor, Professor V.L. Granger ;
- iii) my typist, Mrs P Squires ; and
- iv) my Mother and Father.

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KEYNOTES

1a A privilege.

"University grounds are private property. It is a privilege to bring a vehicle into the grounds."

(from "Preamble to **Resolutions of Senate : Regulation of Traffic Within the University**, University of Sydney, 1971.)

1b A right.

"Many staff and students consider their constitutional rights to include a guarantee of a place to park their cars on campus."

(Joseph Guyton and George Reed, "Planning for campus traffic and parking," **Transportation Engineering Journal** of ASCE, Feb 1971, p 63.)

2a The present.

"A campus parking permit is rather like a bear hunting license — it entitles you to one, but it won't help you find one."

("The great space race," **College and University Business**, Nov 1970, p 47.)

2b The future.

"What about education if students can't get to the campus to pick it up?"

(J H Quigley, "Don't let the future catch you," **College and University Business**, Oct 1970, p 39.)

ABBREVIATIONS

The following abbreviations are used to denote each **campus**.(1)

| | |
|--------|---|
| UCT | University of Cape Town*, Groote Schuur upper campus. |
| UWC | University of the Western Cape, Modderdam Road campus. |
| UStell | Universiteit van Stellenbosch*, Stellenbosch campus. |
| UPE | University of Port Elizabeth*, Driftsands campus. |
| URhod | Rhodes University, Grahamstown campus. |
| UOVS | Universiteit van die Oranje-Vrystaat, Bloemfontein campus. |
| UND | University of Natal*, Durban (King George V Avenue) campus. |
| UDW | University of Durban-Westville, Chiltern Hills campus. |
| UPret | Universiteit van Pretoria*, Brooklyn campus. |
| PUCHO | Potchefstroomse Universiteit vir Christelike Hoër Onderwys, Potchefstroom campus. |
| RAU | Randse Afrikaanse Universiteit, Auckland Park campus. |
| UWits | University of the Witwatersrand*, Jan Smuts Avenue campus. |
| UNISA | University of South Africa, Muckleneuk campus. |

(* Indicates that these universities have other campuses.)

The following abbreviations are also used :-

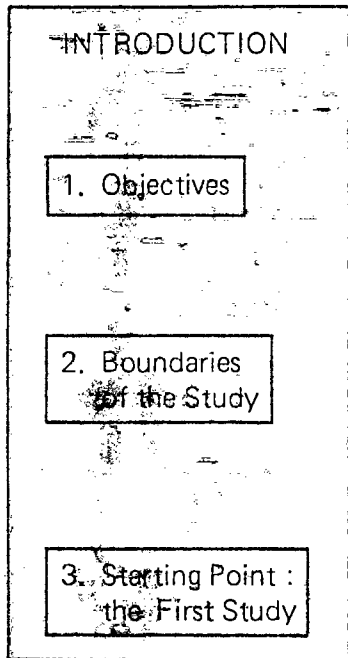
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|-----|---------------------------------|
| RSA | Republic of South Africa |
| GDP | Gross domestic product |
| SRC | Students Representative Council |

In the Tables :-

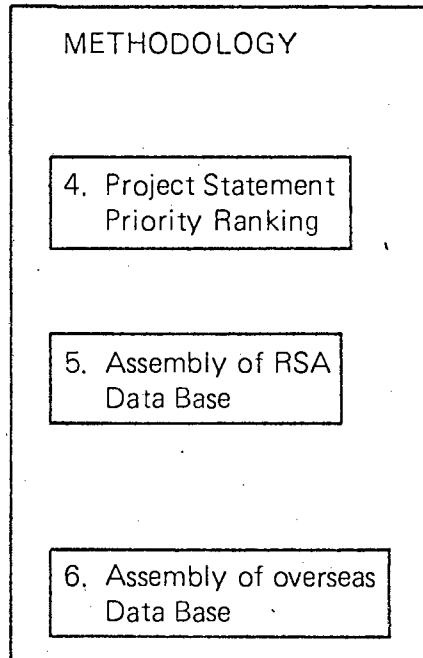
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In accordance with modern good practice, this thesis is written in the first person singular.
(See Houp, K.W. and Pearsall, T.E., **Reporting Technical Information**, Glencoe Press, 1973, p118).

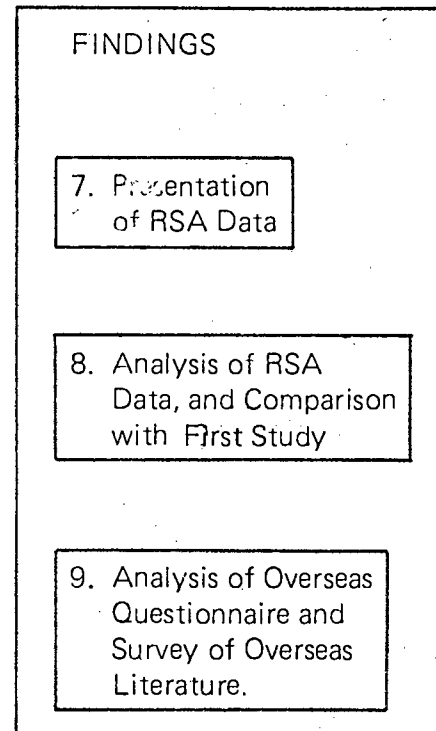
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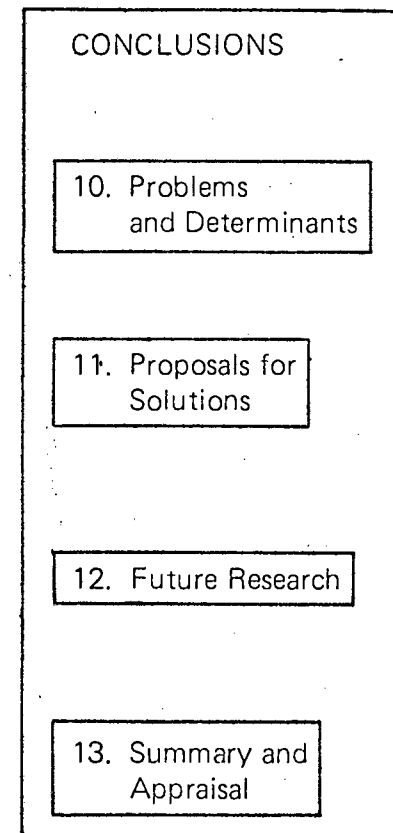
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III



IV



CHAPTER 1

OBJECTIVES OF THE THESIS

In recent years, all universities in RSA have increased their enrolments at a rapid rate.(2) Four new campuses have been established,(3) and several universities have purchased options on land for satellite campuses which promise to be larger than their parents.(4,5)

Provision for this growth requires appropriate planning. As Pinnell and Wacholder have concisely described it : "A desired planning process for an educational institution is comprised of a rather extensive system of interrelated and interdependent efforts. The total planning effort can logically be divided into three major phases which are listed as follows :

- i) Management and program planning,
- ii) Physical plant planning, and
- iii) Financial planning.

A successful planning system will contain all these major phases and will finally merge them into a single product."(6) Fig. 1 illustrates the concept.(7)

This thesis will confine itself to a consideration of "transportation planning", but the environment of Fig. 1 should not be forgotten, and reference will be made from time to time to the constraints which it imposes. Especially, the **service** nature of transportation must be realised ; it is not an end in itself.(8) Too often, transportation studies make insufficient acknowledgement of the bi-directional influence of transportation and land use planning,(9) and ignore the potential role of transportation as an instrument of socio-economic policy.(10)

At this point, a quick description of what is meant by "transportation" in the present context is appropriate. This term comprises all matters pertaining to :

- i) Access to and egress from the campus.
- ii) Internal circulation on the campus (whether of vehicles or pedestrians).
- iii) Parking on the campus.

All RSA universities have recently devoted increasing attention to transportation planning, whether this attention be directed towards :

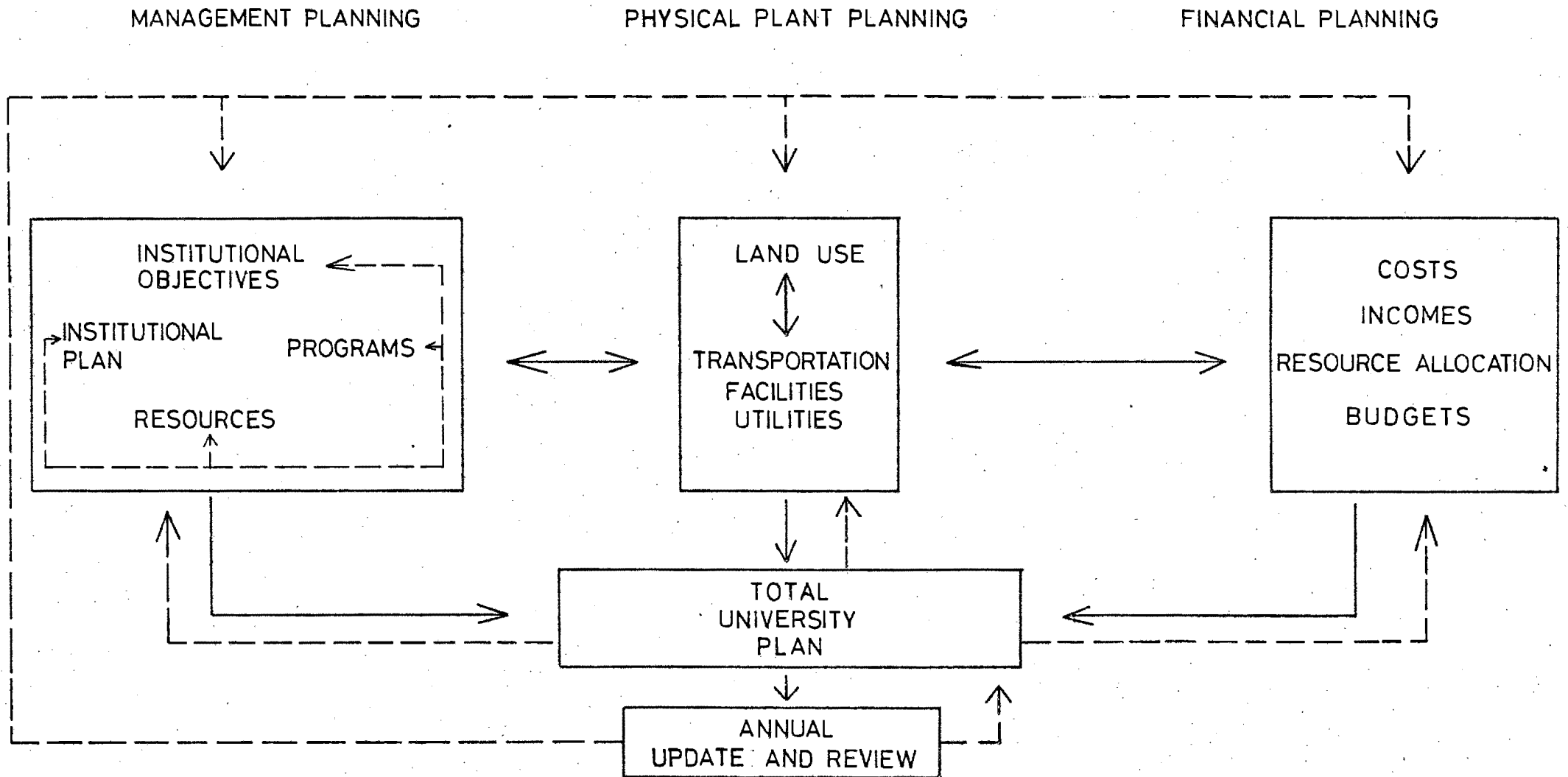


FIG.1 UNIVERSITY PLANNING SYSTEM.

- i) Finding solutions for immediate problems.
- ii) Finding solutions for long-term problems of expansion or of the establishment of a new campus.

There is clearly a need to draw together the data which each of these individual universities have garnered. Furthermore, many overseas universities are experiencing similar problems ; no doubt some of the data and possibly some solutions too could be of use in RSA.

The specific objectives of this thesis are therefore :

- i) To discover the present state in RSA of the university campus transportation problem, and of the planning towards its solution.
- ii) To present information, in a comparative manner, on campus transportation patterns in RSA. To critically select overseas information which could make a contribution to the better understanding of the RSA situation.
- iii) To discover factors that influence campus transportation patterns.
- iv) To discuss directions towards generalised solutions to the transportation problem in respect of RSA campuses. To survey the overseas experience of these solutions and to critically comment thereon.
- v) To discuss possible trends in campus transportation.
- vi) To draw up a list of further research required.

Ideally, it would be desirable to formulate a generalised policy of physical development/timetable arrangement/financial policy to "solve" the transportation problems, but this places too great a demand on my limited resources.

CHAPTER 2

BOUNDARIES OF THE STUDY

Inevitably, all the interest lies in, and thus all the attention is focussed on, those universities attended by White, Asian or Coloured persons. The segregated black universities are all comparatively small, and are located in rural or peri-urban areas. Furthermore, nearly all students are in university residences either on the campus or within walking distance of the campus.(11) Comparatively few students have cars.(12)

CHAPTER 3

STARTING POINT : THE FIRST STUDY

In 1971, in partial fulfilment of the requirements for my planning degree, I wrote a thesis entitled "Transportation aspects of Southern African universities." (13) This involved a questionnaire survey (1970 data) to universities in Southern Africa, (14) and an analysis of the results thereof. A fair summary of this study appears in my 1973 paper "An investigation into South African campus transportation problems." (15)

Much has changed since then. Apart from the new campuses mentioned in the opening paragraph of the present thesis, and the expansion that has taken place on existing campuses, there is evidence that, as predicted in 1971, (16) the universities have passed the stage where the provision of more parking is seen as the solution for all their ills. Attention has swung from an exclusive focus on the private car. Patterns of car ownership, of bus service sponsorship by the university, of pedestrian needs and of university land use and timetable utilization policy have changed, some drastically, and it would be interesting to discover the extent of and reasons for these trends. Perhaps the most significant changes though have come in respect of the increased use made of specialist planning advice by the universities, changing attitudes towards pricing policies of "transportation" as a saleable commodity, and an increasing involvement (at some universities) of students and academic staff in the decision process.

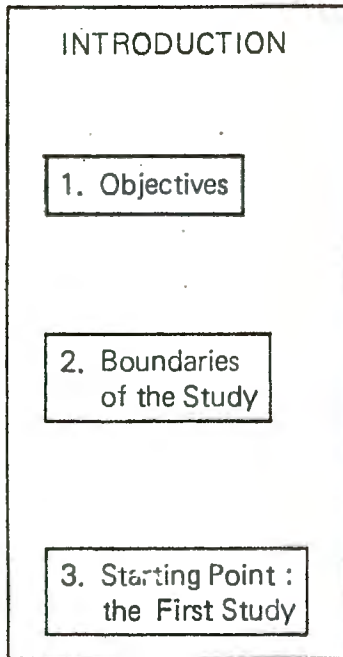
Furthermore, much information is available on overseas universities, (17) or could be solicited ; no doubt much of this, carefully screened for appropriateness, could throw light on the RSA problem.

Hence my conclusion, when confronted in late 1977 with the need for a thesis in partial fulfilment of the MSc (Eng) degree, that a greatly expanded re-study of the subject "transportation problems on South African university campuses" would be even more useful to the RSA university planning authorities than was the original study. Especially attractive was the prospect of deduction of trends from a comparison between the 1970 and the 1977 situations on particular campuses.

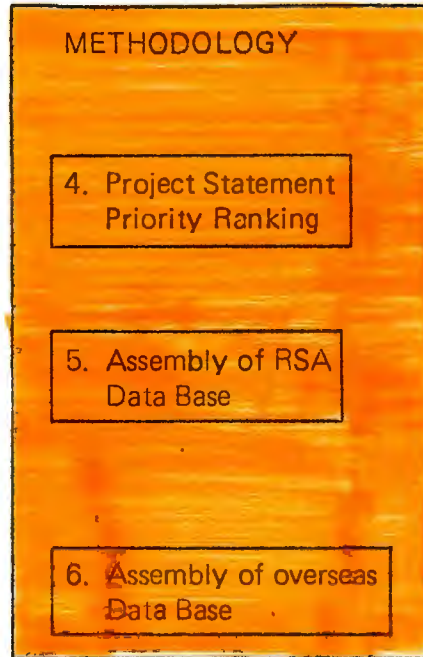
During a "grand tour" of RSA campuses in 1973, and in subsequent correspondence with the universities, I learnt that transportation problems rank high on the list of problems of current concern to RSA university authorities. This is supported by American experience ; for example, a study of "institutions of higher education" revealed that "traffic and parking auto-

mobile-related problems rank one and two respectively, and are the only college-community problems reported as existing in sixty percent or more of surveyed communities. By contrast, the next most important problems – housing and drug abuse – were reported as critical by only half of the respondents in their study.”(18)

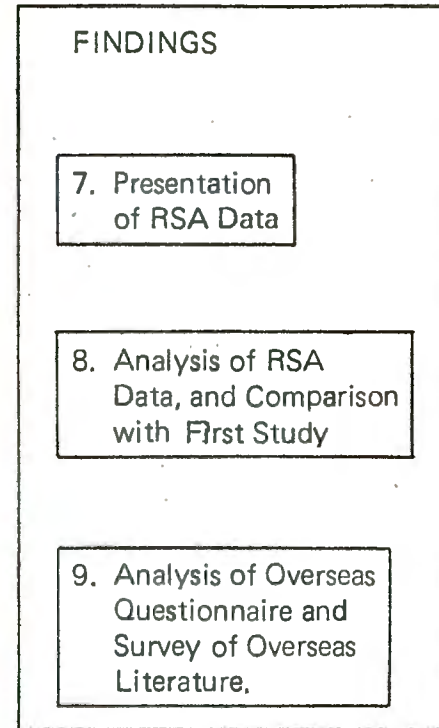
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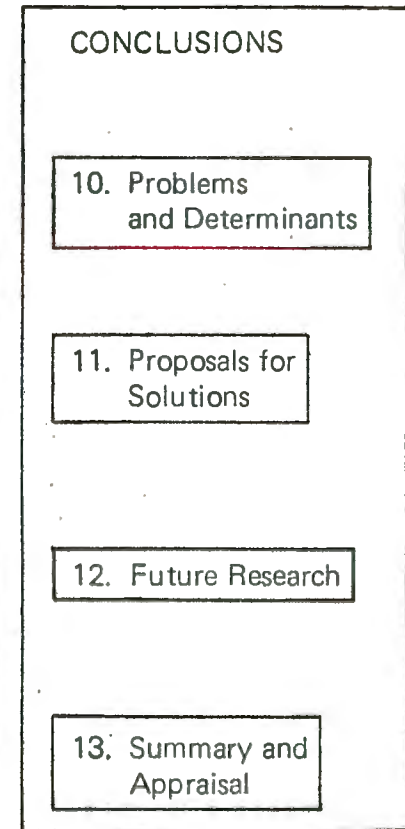
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CHAPTER 4

PROJECT STATEMENT PRIORITY RANKING

Given my limited resources, it was immediately apparent that I should concentrate my studies on selected aspects within the broad field of university transportation. I was also aware, from previous experience (the 1970 questionnaire) that I would be more likely to receive a better response from the universities if I sent them a short questionnaire asking for selected data than a long questionnaire asking for a wider range of data.

How best to select? The Highway Research Board's circular on "Research Problem Statements" provides "guidance for allocation of scarce financial and manpower resources for research work."(19) Their technique is "to prepare a list of high priority research areas" and "to expand that list into a series of problem statements." For example, if the field of research was "freeway operations" examples of problem statements were :

- i) "Investigate the frequency, location and characteristics (including departure angles and speeds) of single vehicle run-off roadway accidents."
- ii) "Devise improved cost effectiveness models applicable to preparing spot improvement construction program priorities."
- iii) "Examine and suggest criteria for regulating vehicle design elements as they relate to and correlate with roadway design elements."
- iv) "Review present freeway guide signing practices, particularly in areas of legend size, letter style and quantity and quality of information required by the driver."(20)

They then submit this list to a chosen number of experts, and ask them to give each project statement a priority index which will, after aggregation, enable the statements to be rank ordered. Additional project statements are solicited at the time of submission. This technique "provides a quantitative method by which to reflect the expertise of . . . into the process of setting priorities for potential research projects."(21)

I decided to use the same technique for my investigation, and to ask the universities themselves to give the priority indices. Accordingly I drew up a list of eighteen project statements covering various aspects of "the transportation characteristics of the students and staff who commute to the teaching campuses every day," and sent a copy to each university, addressed to the Registrar.(22) These requests were sent under cover of a letter and explanatory note (see Appendix A). Three universities did not reply, and one pleaded present pressure

of work, but promised future assistance. From the remaining eight requests, the following priority ranking was established.(23)

Statement 16 achieved top ranking thanks to the high priority accorded to it by all correspondents :

- 16 Prepare warrants for the imposition by university authorities of various alternative "stick" methods of restricting car use, eg. —

- by edict
- by pricing
- by congestion

Compare with the "carrot" methods of providing a convenient and cheap alternative (to the car) means of getting to campus.

Comment on the readiness (or otherwise) of the student and staff population to accept solutions such as those listed above.

Next support went to a group of statements which failed to achieve top ranking primarily because one or other university (never the same one ; it varied) marked each one of them down. They were statement 5, followed by statements 14, 15, 17 and 18.

- 5 Identify the effect of class schedules on the peaking characteristics of —

- parking demand
- entry and exit congestion

Critically comment on measures which could reduce the peak, and on the practicability of employing such measures.

- 14 Determine correlation between number of parking spaces and demand for parking spaces (including latent demand), viewed against the background of any other known factors. Comment critically.

- 15 Determine the implications of various alternative methods of allocating parking bays, eg. —

- first come first served
- bays for exclusive personal use
- a "pool" of bays for the use of privileged groups
- parking meters

Comment on how these relate to drivers' needs and/or status.

- 17 Review present disciplinary measures, such as —

- numbers and duties of traffic officers on university payrolls

— power of university traffic courts.

Comment critically.

- 18 Review the extent to which universities have prepared transportation and parking policies and plans of their campuses. Review the objectives of these policies and plans. Comment critically.

Next came statements 2, 4, 6, 9 and 10.

- 2 Identify, quantify and show cause and effect relationships between observed transportation characteristics and —
- size of university population, in comparison to population of the urban area within which the campus is located
 - location of campus with respect to location of student places of residence
 - proportion of student population in official residences (as opposed to private lodgings), and the university policy towards car ownership by students in official residences.
- 4 Identify the sources of finance available to universities for transportation improvements of various types (ranging from the painting of parking bays, through bus subsidies, to the construction of parking decks). Comment on the present prospects of such finance being available.
- 6 Measure the rate of growth of transportation demand (using a suitable indicator of this demand, eg. increase in car traffic entering the campus) in comparison to the rate of growth of student population, and to the growth of transportation demand by Whites in urban CBD situations. Predict future levels of transportation demand.
- 9 Investigate the level of the parking space demand/real estate value combination at which it becomes more economical to build parking structures than to allow surface lots to proliferate. Determine the fees which should be charged for each parking space, in view of commuter resistance to paying and of original building costs.
- 10 Investigate the level of and reasons for various sanctions exercised by university authorities against car usership by selected student groups (eg. banning first-years' cars from the campus.) Comment critically, paying particular attention to the extent to which the authorities' objectives have been achieved.

Then came statements 1, 3, 7, 8, 11 and 12. The latter two had the widest variation in priority ranking from university to university. For example, RAU gave zero rankings all around (for A and B on both 11 and 12) and U Stell gave ones all round, whereas UCT (Watkins) gave tens all round. Which rather surprises me, for I would have expected that UStell, for example, would, with its campus dispersed around the town, have been very interested in matters affecting public roads crossing the campus. I can understand why UCT is so interested in traffic congestion at the entrance to the campus; I see the problem every morning on my way to work in Rondebosch!

- 1 Survey campus transportation planning – who does it, what resources are allocated to it, is it integrated with the planning of the campus building programme and the scheduling of campus activities? Comment critically.
- 3 Review degree of liaison, and the apparent benefits of such liaison, between the university, municipal traffic and transportation authorities and (if any) private bus operators. Comment critically.
- 7 Measure modal split trends, principally –
 - shift between use of 4-wheel and 2-wheel transport
 - shift between public and private transport.

Comment critically on the influence on modal choice of the availability of alternative transportation modes, of parking policies and of university student housing policies.
- 8 Determine the present level of bus services to campuses, and the subsidy systems which operate. Comment critically.
- 11 Investigate methods of control (and effectiveness of such methods) by university authorities on parking immediately outside the boundary of the campus, or on public roads crossing the campus. Comment critically.
- 12 Investigate methods of control (and effectiveness of such methods) by university authorities on traffic congestion immediately outside the boundary of the campus, or on public roads crossing the campus. Comment critically.

Last in the pile, due to consistent low scoring by all universities (except for UCT's expressed interest in techniques for promoting the use of car pools,⁽²⁴⁾ came project statement 13.

- 13 Measure trends in car occupancy rate, use of car pools, and hitching. Investigate correlation between these trends and any other known factors. Comment critically.

Despite the allowance, in slot 19, for "problem areas of concern (which) are not on the list," no additions were made by any of the correspondents.

Allowance was made for a distinction to be drawn between the priority ranking given to the "importance" of a project and the ranking given to its "urgency." (See Appendix A.) However in only eight percent of unaggregated answers did "urgency" receive a higher score than its "importance" counterpart. In the aggregated rankings, "urgency" scored the same or less than (but never more than one-and-a-half points on the zero to ten scale less than) "importance." Hence the rank ordering described in this chapter can be taken to have equal validity whether "importance" or "urgency" is considered.

In retrospect, whereas this general method of discovering valid research priorities has much to commend it, my execution of the investigation had a fault. I should have given my correspondents guidance as to how I wanted them to indicate current work in progress. A project statement may have been given a high index by one university because they knew work was under way, while another may have ranked the statement low for the same reason. (25)

Powers stated that he had taken the latter attitude in respect of UND : "hence the somewhat negative indication of interest in aspects for consideration in your study." (26, 27) I was unable to determine if this biased the results.

To sum up, each university inevitably has different transportation knowledge needs by reason of factors such as —

- different stages of growth ;
- different student residence policies ;
- location in urban (or suburban) areas with different characteristics, especially in respect of public transport provision ; and
- different relation to the public road system (some campuses, for example Stellenbosch, are dispersed around a town, while others, like RAU, are not encroached upon by public roads at all).

However, in a limited research project such as the present one, the research priorities must be aggregated in order to reduce the research area to manageable size. This I did, using a very reasonable method as shown in the project statements above.

CHAPTER 5

ASSEMBLY OF RSA DATA BASE

5.1 QUESTIONNAIRE SURVEY

Using the aggregated ranking of research priorities described in Chapter 4 above as a guide, the questionnaire was then drawn up, and was posted to all universities early in 1978. Note that the answers (are there final answers?) to problem statement 16 is not obtainable from any **data** survey. No wonder this problem statement received such high priority!

The questionnaire, together with covering letters, may be found in Appendix B.

The response was excellent, which may be taken as further evidence of the increased interest of the university authorities in transportation planning matters.(28) Only two universities (UWits and UNISA), pleading pressure of work, failed to return completed questionnaires, but some information was fortunately available from alternative sources.

5.2 INTERVIEWS, VISITS AND LITERATURE SURVEY

At the time of the 1970 survey, I had no first-hand experience of any campuses other than UCT. Fortunately, owing to an employment transfer, I during 1972 and 1973 lived in central Stellenbosch and daily saw the extent of that University's transportation problem. I was fortunate too in being able to cultivate useful contacts in the University hierarchy.(29) During 1973 I undertook a "grand tour" of seven RSA universities and held discussions with the responsible planning officer in each instance.(30)

With the resuscitation of this thesis subject in 1977, I was very fortunate in that my appointed supervisor(31) was, as Chairman of the University's Traffic Committee, not only knowledgeable in himself, but in a position to put me in touch with others on the UCT staff who were able to help my quest.

Planning, by consultants or specialist in-house teams, has since 1971 played a greater role on RSA campuses than hitherto, and several planning reports have been published. These will be referred to at appropriate points in the present volume. Special mention should be made of the integrated work at UCT by the long-established Planning Unit(32) and their traffic consultants.(33)

CHAPTER 6

ASSEMBLY OF OVERSEAS DATA BASE

6.1 QUESTIONNAIRE SURVEY

Data were, for two reasons, sought in 1971 and 1972 from universities in overseas countries. Firstly, in order to discover at a general level what problems were being encountered and what solutions were being proposed. Secondly, at a more detailed level, in order to broaden the data base of the questionnaire survey.

The selection of universities in which countries to approach was made on the basis of similarity of key socio-economic population characteristics of the countries concerned with the same characteristics of the RSA White population. It must be stressed however that there was at no stage any intention of merging the overseas data anonymously with the RSA data — the unique circumstances of each country must continue to be recognised.

The key socio-economic population characteristics employed were :

- i) Number of cars (automobiles) per 1 000 population.
- ii) Number of full-time university students per 1 000 population.
- iii) Percentage of population in the 20 to 24 age group.

These characteristics were chosen for their self-evident appropriateness to a comparison of university transportation habits. (Note that of the age groups commonly found in international statistical tables, the 20 to 24 age group is closest to the expected range of university students' ages.)

Other statistics were considered, but were discarded. For example, "GDP per person" suffered from the disability that, firstly, a high GDP perhaps reflected no more than a high cost structure in the country, and that secondly, it is difficult in RSA to separate the "White" GDP from the national figure. A similar objection is raised to any other cost-based comparisons, such as "expenditure on education per capita," or "highway expenditure per capita."

The results of the comparison are shown in Table 1. For contrast, the same statistics are tabulated for RSA all races and for RSA Coloured persons only.

It will be seen that the populations of Canada, Australia and New Zealand had key

TABLE 1

FIRST COMPARISON OF KEY STATISTICS RELATING WHITE RSA TO
POPULATIONS OF SELECTED NATIONS

| | Cars per 1 000 population | Full-time university students per 1 000 pop. | Percentage of pop. 20 to 24 group |
|----------------------|------------------------------|---|--------------------------------------|
| RSA White persons | 303 | 11,6 | 8,3 |
| Canada | 277 | 10,9 | 7,3 |
| Australia | 267 | 4,8 | 7,4 |
| NZ | 294 | 5,8 | 7,2 |
| UK | 191 | 3,7 | 6,6 |
| USA | 400 | 23,1 | 7,8 |
| for comparison : | | | |
| RSA all races | 70 | 2,8 | 8,6 |
| RSA Coloured persons | 16 | 0,4 | 8,9 |

This Table, compiled in 1971, reflects data for assorted years from 1965 to 1970, adjusted to 1968.(34)

statistical characteristics which were relatively very close to that of RSA White persons. Hence in 1971 an approach was made, using an identical questionnaire to that in my 1970 survey of RSA universities, to all universities in Canada, Australia and New Zealand.

Twenty-five questionnaires were returned completed, out of fifty-one sent out.(35)

A check was recently made (see Table 2) on the equivalent up-dated statistics for the same set of countries as Table 1. This check confirms the original choice.(37)

6.2 INTERVIEWS, VISITS AND LITERATURE SURVEY

During a study visit to UK in 1974/75, I took the opportunity on four campuses of visiting planning personnel with whom I had previously corresponded.(38) Several other universities were visited, but no discussions were held on transportation planning, though a general impression of the transportation situation was gained on the visits.(39)

Similarly, during my 1977/78 planning study visit to Israel, general impressions only were gained of transportation matters at universities visited.(40)

In North America, university transportation studies and reports and articles on university transportation planning in general abound. (For examples in my possession of the former see reference 41, and of the latter see 42.)

Australia and New Zealand are more like RSA — there is less literature in evidence. (For examples of specific studies see 43, and of general studies see 44, all in my possession.)

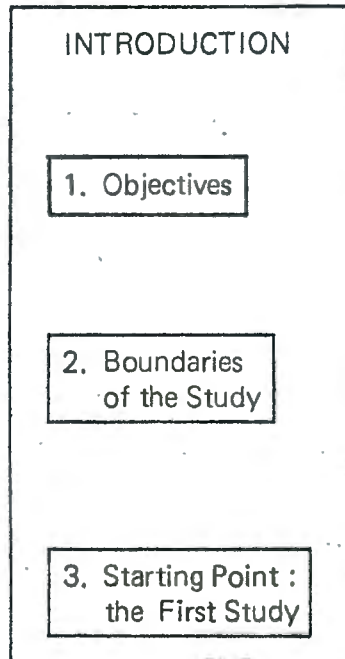
TABLE 2

SECOND COMPARISON OF KEY STATISTICS RELATING WHITE RSA TO
POPULATIONS OF SELECTED NATIONS

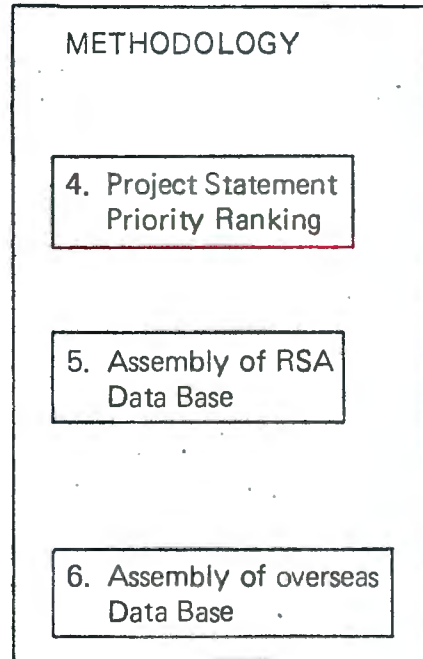
| | Cars per 1 000 population | Full-time university students per 1 000 pop. | Percentage of pop. in 20 to 24 group |
|----------------------|------------------------------|---|---|
| RSA White persons | 418 | 16,5 | 8,5 |
| Canada | 345 | 14,6 | 9,0 |
| Australia | 395 | 7,0 | 8,4 |
| NZ | 373 | 8,2 | 8,0 |
| UK | 246 | 4,2 | 7,6 |
| USA | 488 | 27,4 | 8,1 |
| for comparison : | | | |
| RSA all races | 83 | 3,1 | 8,5 |
| RSA Coloured persons | 27 | 0,7 | 8,5 |

This Table, compiled in 1978, reflects data for assorted years from 1970 to 1977, adjusted where possible to 1975.(36)

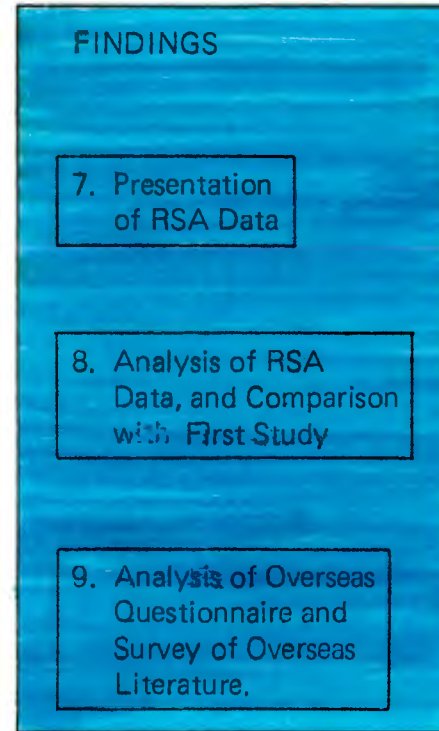
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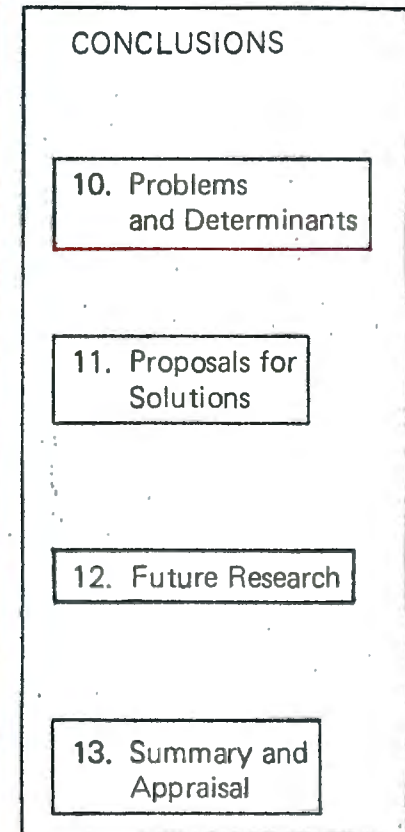
II



III



IV



CHAPTER 7

PRESENTATION OF RSA DATA

In this chapter, the results of the 1977 questionnaire survey are presented, for the most part with-out comment.(45) Supplementary RSA information sources, particularly publications on university planning and prospectuses are drawn upon.

To simplify matters, the questionnaire elicited answers in respect of the main campus only. Whereas most universities have more than one campus, the second (or subsequent) campuses are invariably very much smaller in terms of full-time student members, or are specialist campuses, or concentrate on part-time evenings-only students, or house sports facilities or student residences only.(46)

The influence of "special events" was ignored, for the reason that special control measures (for example, extra police on duty, traffic diversions, and emergency parking areas) can usually be brought to bear should an especially demanding "special event" take place. This study confines itself to the normal daily term-time operation of the campus.

7.1 POPULATION

Refer Table 3. The proportion of students living on-campus is not necessarily a guide to the number of students who could be expected to walk to the campus; in the case of most universities, many other students (and staff) live in homes, private lodgings or official residences located close to the campus.

7.2 TRANSPORTATION PLANNING PROGRAMME

The picture has brightened since 1971;(48) nearly all the universities employ full-time planning staff. Three campuses have recently enjoyed the attention of transportation planners, viz UCT, UND(49) and UStell.(50) It is encouraging to note that the results of all three studies are being routed through the in-house planning staff; this will hopefully ensure that my doubts on a possible lack of co-ordination between the transportation plan and the land-use plan, expressed in Chapter 1, are groundless.

TABLE 3

RSA CAMPUS POPULATIONS 1977(47)

| Campus | Full-time students | | Staff | | Total campus population | Staff as % of population |
|--------|--------------------|--------------------|-----------------------|---------------------------|-------------------------|--------------------------|
| | Number | % living on-campus | Academic and clerical | Messengers, cleaners etc. | | |
| UCT | 7 990 | 6 ^(a) | 1 675 | 515 | 10 180 | 22 |
| UWC | 2 500 | 20 | 600 | 100 | 3 200 | 22 |
| UStell | 8 950 | 52 | 870 | 550 | 10 370 | 14 |
| UPE | 3 100 | 27 | 520 | 250 | 3 870 | 20 |
| URhod | 2 320 | 68 | 600 | 200 | 3 120 | 26 |
| UOVS | 6 340 | 48 | 1 110 | 860 | 8 310 | 24 |
| UND | 4 720 | 29 | 650 | 220 | 5 590 | 16 |
| UDW | 3 000 | 17 | 530 | 120 | 3 650 | 18 |
| UPret | 16 100 | 12 ^(b) | 3 300 | 1 140 | 20 540 | 22 |
| PUCHO | 5 000 | 68 | 910 | 410 | 6 320 | 21 |
| RAU | 3 700 | 35 | 520 | 300 | 4 520 | 18 |
| UWits | 8 000 | 9 | — | — | — | — |
| UNISA | 0 | 0 | — | — | 1 350 | 100 |

The percentage of staff living on campus is usually negligible.

Notes :

- (a) Excluding residences on the middle and lower campuses, ranging from half kilometre to one kilometre distant.
- (b) Excluding mens' residences, two kilometres distant.

RAU and UPE are both satisfied that they need not for the foreseeable future look beyond the traffic reports drawn up at the time of initial site planning.(51)

The other universities do not appear to be seeking the advice of specialist transportation planners.

7.3 OBJECTIVES OF TRANSPORTATION PLANNING

In only five cases would it appear that the objectives of the transportation planning for the campus have been stated.

UStell's objectives are :

- "i) To relieve existing high pressure on the poor but historic street network of Stellenbosch.
- ii) To ensure maximum separation of pedestrian traffic and wheeled traffic.
- iii) To construct a campus free of the motor car as far as is possible."(52)

The transportation engineering consultants to UCT stress that "transportation planning for the University must begin with an understanding of the relationship between the university and the surrounding community and between transportation and total university development."(53) They then state the components of UCT's transportation planning objectives within this context. These may be summarised as follows :

- i) Good road accessibility and public transport links, and minimum conflict between inter-campus traffic and non-university traffic.
- ii) Convenient and safe circulation within the campus.
- iii) An effective management policy of parking space which will lead to a balance between supply and demand, and an efficient use of space.(54)

The consultants then point out that the co-ordination of the objectives of each component (ie. accessibility, internal circulation, and parking) must be considered, and also the relationship between the campus planning process and the goals of the community in general. Hence a set of overall transportation planning objectives for UCT, here quoted in full :

- "a) A balance should be achieved between the three components of the plan such that the transportation requirements of the land-use plan are efficiently and safely met.
- b) The plan should be flexible so that unforeseen changes in University or community planning can be reflected in the transportation plan without having to abandon whole aspects of that plan.

- c) The size, scope and design of transport schemes envisaged in the plan must coincide with the architectural and landscape quality of the land users which such facilities are designed to serve."(55, 56)

The consultant traffic engineers for RAU, with power to influence the form of university from its earliest planning stages towards accommodation for a future "high-technology" transportation solution, very sensibly express their faith as follows : "Although new types of transport will probably be invented in the future, it is logical to accept that these new inventions will not affect (sic) a marked change in the popularity of the motor vehicle (or any other vehicle with comparable transport characteristics) within the next twenty-five years. . . . Therefore this university . . . will, to a large extent,(57) have to be planned with the requirements of the motor vehicle in mind."(58)

RAU like UCT above, stress the close association between land-use planning and transportation planning. They then proceed to a detailed statement of objectives within the same framework (viz accessibility, internal circulation and parking); this statement could be summarised in similar terms to UCT above, and will therefore not be repeated. As can perhaps be expected of a pre-planned campus, not constricted on its site (at least in the foreseeable future), there is an emphasis on the solution of inter-modal conflict by physical separation, and on provision at every building of "the necessary" parking space for the number of vehicles drawn there by the activity at those premises.(59)

Nowhere in UND's "Site planning proposals" do the writers state transportation planning objectives as such, but these objectives do emerge from a sympathetic reading of the document. The writers commence with a description of "the ideal pattern for road access and parking facilities serving a university site." It is "that of a peripheral road of adequate capacity giving access into well-distributed parking zones, on the opposite side of which are placed the buildings and facilities which they serve, these roads and parking areas being separated from the lines of pedestrian movement within the central pedestrian precinct and/or other areas of pedestrian concentration."(60) Unfortunately, "the topography of the Durban site,(61) the shape and physical dimensions of its academic centre, and the nature of existing building development together preclude the possibility of evolving such an ideal solution to the campus road circulation and car parking problem."(62) However, all subsequent thought in the "Proposals" is devoted to finding a reasonably workable solution to the campus transportation problems, a solution with as many of the characteristics of the ideal as possible. For example, a compact grouping of academic facilities is desired, thereby "eliminating the need to use a motor car in order to move about within the campus," and thus avoiding "the conflict between wheeled traffic and the large number of pedestrians on the campus."(63)

Primary determinants of the physical form and dimensions of the built up area of the

UPE campus are acknowledged to be traffic and movement, both on foot and in vehicles. One consequent objective set for the planners is the separation of wheeled and pedestrian traffic streams. In the academic core this is achieved by separation on different levels.(64)

7.4 MODAL SPLIT OF ARRIVAL ON THE CAMPUS

Figures are available for only three campuses, viz UStell, UCT and UND (refer Table 4). Note that the mode referred to is the mode of entry to the campus, ie, the use of another mode elsewhere in the journey to or from home is not recorded.

7.5 MASS TRANSPORT

7.5.1 Opinion Survey

A study of the answers to question 3.3 of the 1978 questionnaire(68) reveals that a majority of campuses condemned their public transport provision as "inadequate" to "very inadequate."(69)

7.5.2 Rail Services

PUCHO has a railway station on the campus, and UWC and UPret both have railway stations within 1 kilometre of the campus. Yet none of these campuses report significant use of the train service, presumably either because of the infrequent service or because the service does not cover the areas where students live.

7.5.3 Indirect Bus Services

It would seem that all the campuses in the larger urban areas have bus services operating nearby but not onto the campus. Students and staff make use of these services, and then walk (or, in some cases, hitch or catch another bus, as eg. UCT) to the campus. Unfortunately, no comparative statistics are available. It would seem however that the most fortunate campus is UPret, which lies in a central position relative to the ring of suburbs in which the bulk of the non-resident students and staff live,(70) and on two major arteries well served by buses.(71)

In two cases (viz PUCHO and UStell), the bus service brings Coloured and Black staff to the campus, and does not carry students.

TABLE 4

MODAL SPLIT RSA CAMPUSES 1977

| Mode | STUDENTS ONLY | | STAFF ONLY | | STAFF AND STUDENTS | | |
|------------------|---------------|-------------------|------------|---------|--------------------|-------------------|---------|
| | UStell(65) | UCT(66) | UStell(65) | UCT(66) | UStell(65) | UCT(66) | UND(67) |
| Car driver | } 21 | 37 | } 81 | 59 | } 29 | 42 | 47 |
| Car passenger | | 23 ^(a) | | 12 | | 20 ^(b) | 14 |
| Motorcycle | 2 | } 5 | 1 | } 4 | 2 | } 5 | 5 |
| Pedal cycle | 10 | | 3 | | 9 | | 0 |
| Bus | 0 | 15 | 4 | 2 | 1 | 12 | 3 |
| Walk | 66 | 15 | 9 | 18 | 58 | 16 | 31 |
| Other | 1 | 5 | 2 | 5 | 1 | 5 | 0 |
| Total percentage | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

Notes :

These figures **include** campus residents.

(a) This includes 6 percent hitchhikers.

(b) Figures from the 1976 cordon count(68) reveal that 25 percent of the cars entering the UCT upper campus before 09h45 stayed for less than 15 minutes. This suggests that they "passed through" the campus in order to drop off one or more passengers. At one passenger per car, nearly 1 300 car passengers arrived on campus in this manner. This represents 16 percent of the total arrivals, which leaves only 4 percent passengers in cars which parked on the campus ; this seems impossibly low.

7.5.4 Direct Bus Services

Reference is made here to bus services which actually enter the campus (Table 5). A few comments are required in order to put Table 5 into perspective.

The bus services listed are all, with the sole exception of the UND service, run primarily to convey student and staff commuters to and from the campus. In Durban, the "Howard College" route(74) links the CBD with suburbs and schools strung out along Berea Ridge; hence the greater proportion of the passengers are schoolchildren. Part of the route is the public road King George V Avenue, which crosses the campus; the bus thus incidentally and not very satisfactorily serves the campus.(75)

The UPE bus terminates in the heart of the campus, on a depressed road between the administration building and the library.

The UDW services are run by a consortium of several Indian bus companies, and the complaint has been made that their journey to the campus takes too long because the route is too roundabout and has too many stops.(76)

The UPret service is a free shuttle service between the men's residences and the main campus two kilometres away. The municipal bus authority keeps two buses for exclusive University use, for which privilege the University pays an annual retainer.(77)

The UNISA service is also free, by arrangement between the University and the municipality. It links the central campus with Mears Street railway station and the CBD (Church Square). (Photos 1 and 2.) However, although it terminates at the campus, residents of the suburbs through which it passes may also make use of it on a fare-paying basis; university staff are issued with a pass (on unforgeable card, with identity photograph) which is invalidated every six months and must be renewed, and this pass entitles them to a free ride on any municipal bus route on weekdays only.(78) UNISA pays a retainer for this privilege.

But the campus which has undoubtedly made the most effort in respect of direct bus services is UCT. (Photos 3, 4 and 5.) Originally, as reported in 1971,(79) the University guaranteed the (private) bus company a flat rate to run a service; the company collected fares and subtracted them from this sum, and the University paid the difference to the company. Since 1974, however, the principle has been established that the cost of the bus service, plus the general administrative expenses of campus traffic control,(80) should balance with the revenue from the sale of parking discs, plus traffic fines, plus bus tickets sold,(81) plus a levy on each student. This levy amounted to R5 per head in 1977. In 1978 it rose to R8;(82) the budget estimates for the above exercise for 1978 totalled R105 000 approximately.(83)

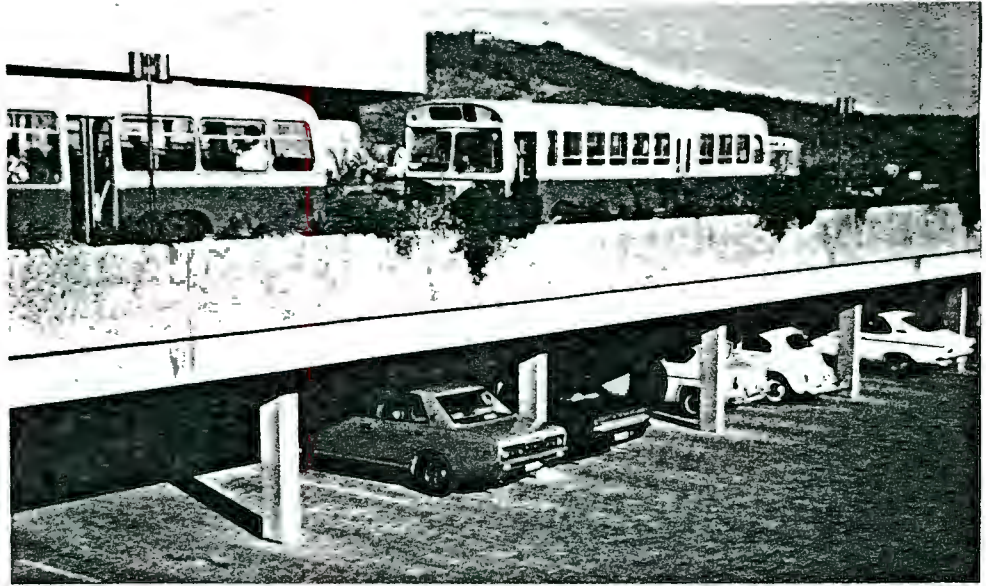
TABLE 5

DIRECT BUS SERVICES : RSA CAMPUSES 1977(72)

| Campus ^(a) | From | Number of buses entering campus | Peak hour degree full | Fare charged? ^(f) | Contribution to modal split (percentage) |
|-----------------------|-------------------------------------|---------------------------------|------------------------------|------------------------------|--|
| UCT | Suburbs, suburban rail station, | 43 ^(b) | three-quarter ^(d) | S | } 12 |
| | CBD and campus near to CBD | 9 | half | S | |
| UPE | CBD, via residences in Summerstrand | 13 ^(b) | three-quarter | E | approx. 9 ^(g) |
| UND | CBD | 45 ^(b) | _(e) | E | 3 |
| UDW | Local bus junction | 20 | full | E | approx. 27 ^{(g)(h)} |
| UPret | Men's hostels | 25 | full | S | approx. 6 ^(g) |
| UNISA | CBD | 20 ^(c) | full | S | approx. 14 ^{(g)(c)(i)} |

Notes :

- (a) UWC, UStell, URhod and RAU do not operate direct bus services. The situation at UWits is not known at the time of writing.
- (b) Weekend service too, on a lesser scale.
- (c) 1973 figure.
- (d) Personal observation 1977 and 1978.
- (e) Mostly non-university passengers (see text.)
- (f) S = Subsidised (see description in text) ; no fares charged.
E = Run on commercial basis by the bus company; fares charged.
- (g) My estimates, based on number of buses and average loading assumed from available evidence.
- (h) Estimate by Eybers was 34 percent. (73)
- (i) Personal observation, 28 Aug 1973.



Photos 1 and 2 : UNISA, showing parking terraces and central position of bus stop.

The idea of the bus service is to act as a collector between nearby public transport nodes and the campus, not as a long-haul service in competition with established transport services.(84) Hence the geographical distribution of services. Most of them begin at one of the nearby commuter railway stations, then "sweep" the suburbs, by different routes, on their way to the UCT upper campus. The residences on the lower campus are also well catered for. The remaining services start either in the CBD or the Hiddingh Hall minor campus near the CBD, and take the six kilometres of expressway to UCT. The buses bringing commuters to the campus are better patronised than the buses leaving campus;(85) this is no doubt due to many commuters finding it more convenient to arrange a lift from a classmate or to hitch their way home.

The most interesting piece of information revealed by the 1976 bus patronage survey is contained in the following quote. "When asked what mode of travel they would have used as an alternative to the bus, 82 percent of the patrons said that they would either have to walk or hitch-hike to get to campus. A further 13 percent said that they would drive a car to campus as an alternative. In terms of vehicles this corresponds to 180 cars, or 4 percent of the total number of cars arriving on the Upper Campus throughout the day."(86) Thus, clearly, the UCT bus service is succeeding in its primary purpose of making the campus more accessible to students living near the public transport nodes referred to above, or able to get to these nodes, who have found travel from these nodes to the campus burdensome. It is not succeeding in the secondary purpose (if that was the purpose) of reducing the number of cars coming to the campus.

However, in 1978 an attempt was commenced specifically to make inroads into the car traffic. Whereas in 1977 eight buses per day started at Rondebosch Fountain, the starting point of these buses (now increased to ten) was in 1978 shifted to Rondebosch Common, where there is more parking space. It is hoped that "more motorists will use the buses to get to work or studies on the Campuses instead of using their cars."(87)

7.6 TRAFFIC INTRUSION AND CONGESTION

7.6.1 Traffic Intrusion

Only three campuses report that non-university traffic crosses the campus. While the problems of UDW are relatively minor,(88) UStell has for many years had to allow traffic from the residential areas on the east of Stellenbosch to traverse the campus on public roads such as Merriman Avenue to reach the business and industrial portions of the town. This traffic currently constitutes one-quarter of the peak cross-campus traffic; however the grid pattern of roads in Stellenbosch finds this no problem.

UND has a problem of a total different magnitude. King George V Avenue runs for



Photo 3 : Bus on the Ring Road, UCT.



Photo 4 : Buses and Bus Shelter, UCT.



Photo 5 : Bus off-loading point at UCT : passengers crossing Ring Road : conflict with vehicles.

900 metres through the oldest and most intensively used portion of the campus.(89) (Photos 6 and 7.) About half the traffic using this road is of non-university origin ; ideas have been put forward from time to time about decking over this road(90) or closing it ;(91) the latter notion is vigorously opposed by the local authority.(92) Despite the strong feeling which the University has about this issue,(93) no improvement has been made to date.(94)

7.6.2 Traffic Congestion at entrances to campuses

Only two campuses admit to congestion on the approach roads to or at the entrances of the campus.

UND report that a build-up of traffic occurs at the northern access for half an hour before first lecture (08h00), due to the exit from the Western Freeway into the single-lane King George V Avenue being overloaded. Other accesses are better off.

The extent of congestion at the northern access to UCT is shown clearly on Photos 8 to 10.(95) Despite the presence of a (municipal) traffic policeman on point duty at the intersection of the off-ramp and Woolsack Road, the ten minutes before first lecture (08h30) is marked by lengthy queues, regularly exceeding forty vehicles in each approach to this intersection.

7.7 CAR ACCUMULATION

At all campuses, lectures for full-time students follow the usual pattern (for RSA universities) of 75 percent (or more) completion by lunch-time. This is reflected in Fig. 2 on which the accumulation of cars on three campuses is plotted on a common base, with vertical ordinates expressed as a percentage of the peak figure.(96) The lunch-time dip is more clearly seen at UStell than at the two "big-city" campuses, reflecting the fact that more UStell commuters, because of the shorter distance involved, go "home" for lunch rather than eat on the campus.

7.8 PARKING PROVISION

Table 6 refers. Two campuses stated that they were presently "overprovided" with parking ; as would be expected, these were UPE and RAU, where provision of parking space on the new campuses has been made in anticipation of a high rate of growth in campus population.

Only one campus stated that it was "very inadequately" provided, viz UPret.(98)



Photos 6 and 7 : Traffic intrusion and parking on King George V Avenue, UND.

See photo 9:

See photo 10.



Photo 8 : Northern access to UCT, showing Woolsack Road approach and off-ramp from Rhodes Drive ; traffic policeman on duty.



Photo 9 : Off-ramp backing up onto Rhodes Drive, UCT.



Photo 10 : Woolsack Road approach, UCT.

↓ INDICATES FIRST LECTURE
▽ STARTING TIME.

% OF PEAK
ACCUMULATION

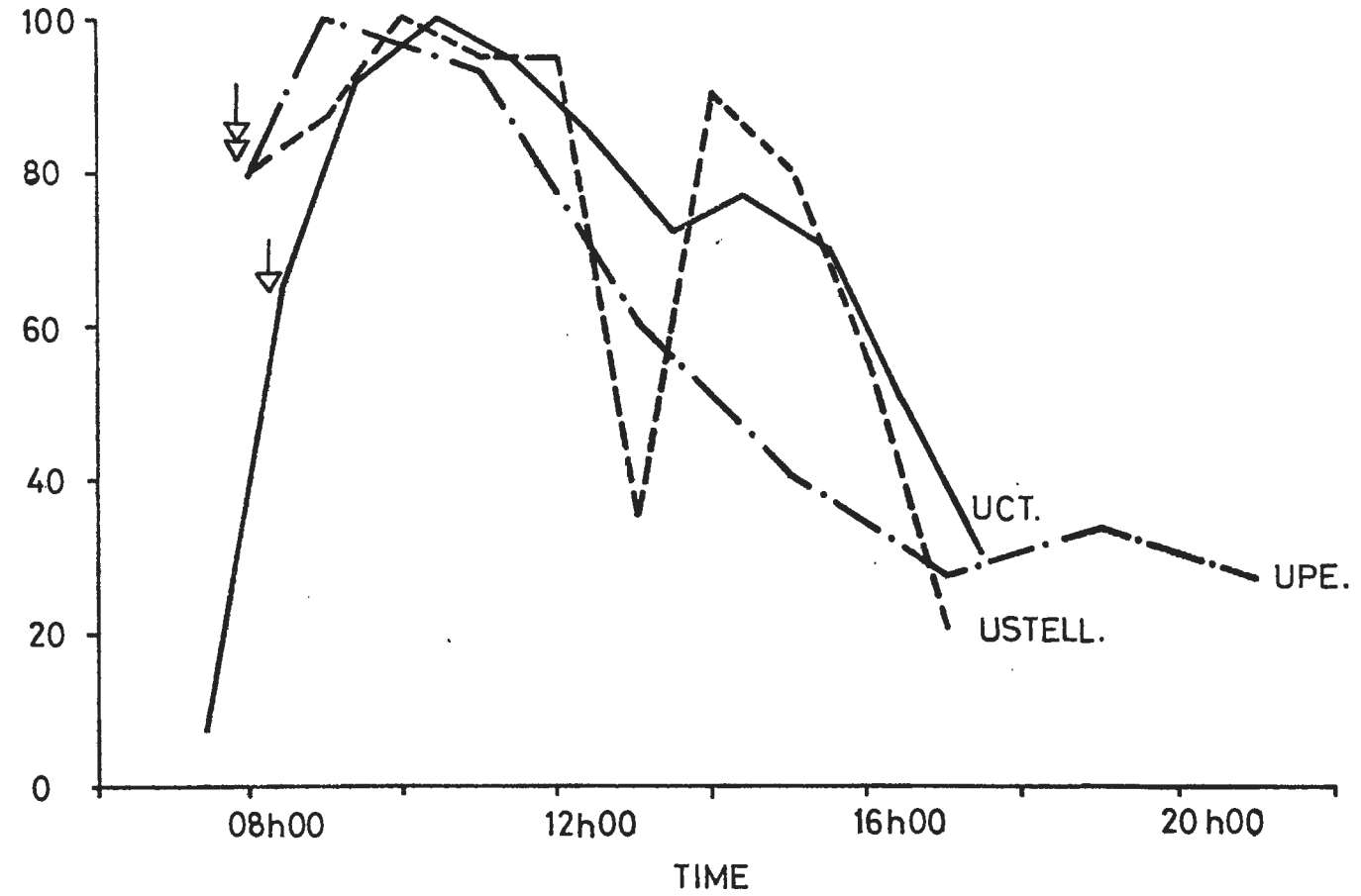


FIG. 2 ACCUMULATION OF CARS ON THREE RSA CAMPUSES.

TABLE 6

PARKING PROVISION : RSA CAMPUSES 1977(97)

| Campus | Legal parking spaces provided on campus | Vacancies | In undefined areas on campus(101) | On public streets | Peak accumulation of cars | Legal parking spaces provided per campus person ("parking space ratio") |
|--|---|-----------|-----------------------------------|----------------------|-----------------------------|---|
| | i | ii | iii | iv | i minus ii plus iii plus iv | |
| Parking "overprovided" or "adequate" (a) : | | | | | | |
| UWC | 615 | — | 185 | 0 | — | 0,19 |
| UStell | 1 900 | 150 | 100 | 1 000 | 2 850 | 0,18 |
| UPE | 1 010 | 255 | 10 | 0 | 765 | 0,26 |
| URhod | 410 | — | — | — | — | 0,13 |
| UND ^(b) | 1 250 | 125 | 500 | 400 ^(c) | — | 0,22 |
| UDW | 760 | — | — | 0 | — | 0,21 |
| PUCHO | 1 000 | 0 | — | 1 000 | — | 0,16 |
| RAU | 1 400 | 410 | 50 | 0 | 1 040 | 0,31 |
| UWits | 1 600 | — | — | 1 900 ^(d) | — | 0,16 |
| UNISA | 485 | — | 200 | 0 | — | 0,36 |
| Parking "inadequate" or "very inadequate" ^(a) : | | | | | | |
| UCT ^(b) | 1 850 | 260 | 185 | 150 ^(e) | 1 925 | 0,18 |
| UOVS | 3 225 | 300 | — | 0 | — | 0,39 |
| UPret | 710 | 20 | 10 | 1 300 | 2 000 | 0,03 |

Notes :

(a) From question 3.1 of the 1978 questionnaire survey.

(b) 1976 figures.

(c) Mainly on King George V and Princess Alice Avenues.

(d) 800 spaces on public streets and 1 100 at Milner Park showgrounds, available for University use if not required by the Agricultural Society.

(e) Stanley Road and Zoo.

Photos 11 to 20, taken at UCT, show the typical effects of "inadequate" provision.(99)

Every campus has, in a variety of proportions :(100)

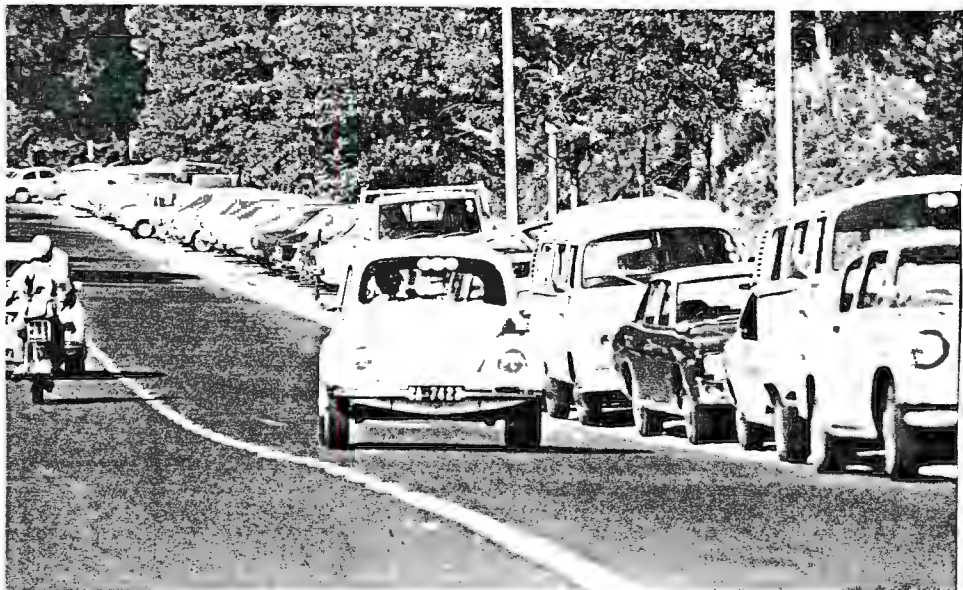
- i) Individual numbered bays, reserved for the exclusive use of particular staff members, usually senior staff.
- ii) Pools of identifiable bays for general use by other staff members and/or senior students on a first-come first-served basis.
- iii) Pools of identifiable bays for general use by the overflow (if any) from (ii) above and by anyone else.
- iv) Identifiable bays for loading and for visitors.
- v) "Undefined areas."(101)

Parking facilities on most campuses take the form of kerbside spaces or off-street parking lots, with a very few covered spaces. Five campuses are the exceptions, viz :

- i) UOVs, which has 795 of its 3 225 spaces under cover. These are all single-storeyed garages or simple shelters, open at the sides.(102)
- ii) UPE has 280 of its 1 010 spaces covered in a similar manner.(103)
- iii) UND has taken advantage of a steeply sloping ridge on which the Shepstone Building, opened in 1973, is placed, to utilise the two lower floors for the parking of 190 cars.(104)
- iv) UWits, partly at the insistence of the City Engineer,(105) has incorporated 300 parking spaces in the two lowest floors of the recently-completed Senate House at the city end of the campus.(106)
- v) UNISA's Muckleneuk site, on a steep hillside, was terraced at the time of building construction in 1972 to provide parking for 380 cars, of which 185 are under cover and 195 are exposed. The nature of this terracing is clear from Photos 1 and 2 ; the roof of the covered parking carries the exposed parking or, on the highest terrace, the bus stops of Preller Street extension.(107)

One further explanation of Table 6. As in 1971 : "The presence of "vacancies" in the midst of so much shortage may be explained as the combined result of —

- the reservation of bays for staff members who are not making use of them at peak parking time, and
- distant location of some official parking areas makes nearby "illegal" (ie. "undefined area") or "public street" parking more attractive."(108)



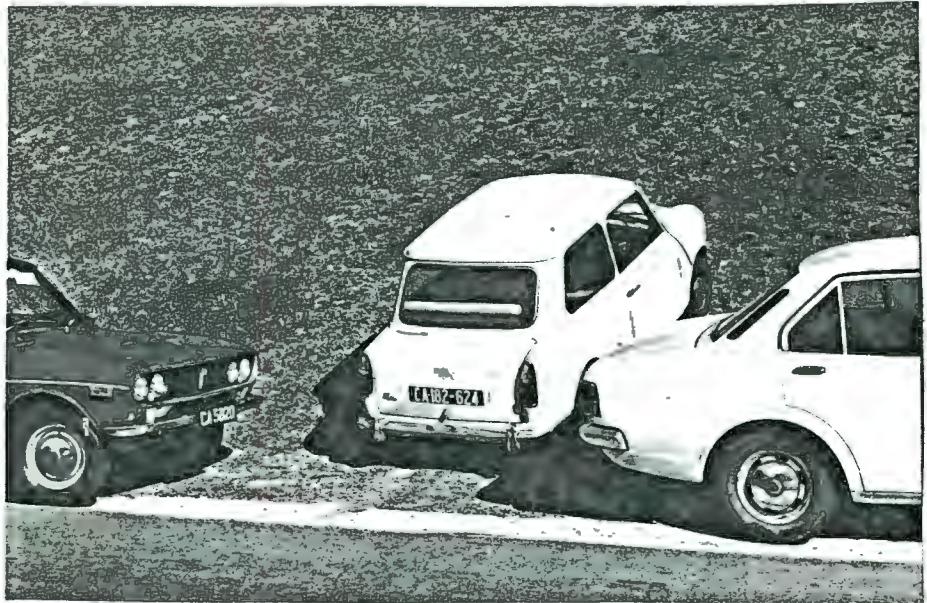
Photos 11 and 12 : Parking in unreserved bays on Upper Ring Road, UCT.



Photos 13 and 14 : Mostly (!) legal parking, UCT.



Photos 15 to 17 : Parking on "Undefined areas", UCT.



Photos 18 to 20 : More opportunistic parking on "undefined areas", UCT.

7.9 CONTROL (109)

7.9.1 Prohibitions

Many RSA campuses exercise some restriction on automobile usage by students or staff.

The most radical is UStell, which has ruled that students who have not successfully completed the academic work of two years are not allowed, except in special circumstances at the discretion of the University, to bring a car into the municipal area of Stellenbosch. (This does not apply to motor cycles.)

First year students in residence may not bring a car onto university property at the following campuses : UPE, UPret, RAU and UWits.

On none of the other campuses are there prohibitions on the ownership of cars. Prohibitions on ~~wl.ere~~ a car may be parked are legion ; mention was made of these in Section 7.8 above.

7.9.2 Cost of parking

Proof that a car may be brought onto the campus, and that it may be parked in a particular spot or zone, is invariably in the form of a disc which must be displayed on the wind-screen of the car. The car must therefore first be registered with the university authorities. These discs are not transferable from car to car, and therefore special arrangements must be made should a legitimate parker change his car, even temporarily.

The cost of these discs covers a wide range. They are free to students and staff at UWC, UND, UDW (except for covered bays), UPret, PUCHO and RAU, and to staff at UStell. They are obtainable at a charge of less than R1 per annum to students and staff at UPE and UOVS (except for covered bays).

Numbered individual bays for students in residence cost R5 per annum at UCT and R10 at UStell. Bays in the non-residential student "pool" at UCT cost R10 per annum, against R20 at UWits.(110)

Covered reserved individual parking, available to anyone, costs R32 per annum at UPE, R16 per annum at UOVS, and R24 per annum at UNISA. Uncovered bays for staff at UCT in the "pool" cost R15 per annum, whereas if they are reserved individually they cost R20. At UWits, covered reserved bays cost R50 per annum in Senate House and R40 elsewhere ; uncovered reserved bays cost R30 per annum against R20 for unreserved. The parking bays in

Shepstone are available to UND staff at R72 per annum.

Where the fees are nominal, parking clearly does not pay for itself. At UWits, "the fees are intended to cover salaries and the running and maintenance costs (of the parking) of approximately R30 000 per year."(111) The use of parking fees at UCT to assist in paying for the direct bus service has already been mentioned.(112, 113)

7.9.3 Policing

UCT boasts a formidable ten-strong traffic force. UOVS, UDW and UWits have six traffic officers each, UStell have four, and UPE and PUCHO have one each. All these have the power to impose fines for a range of parking and traffic offences.

RAU report that they do not have traffic officers, but : "Daar is egter 'n persoon wat ongematigde parkeerders se karre "vasboei" (dit is 'n ysterklamp wat om een van die voertuig se wiele gesluit word). By tekening van 'n skuld erkenning van R10 word die "boei" weer oopgesluit."(114)

Three universities have parking attendants only, who cannot impose fines. These are UND (eight attendants), UPret (six) and UNISA (eight). Only UWC has no policing at all.

Policing of public roads is of course left to the municipal traffic police. Only on King George V Avenue does this cause a problem in that the University has no control over congestion and parking in an important part of the campus. The UND authorities leave it to the discretion of the municipality when to take action.

Note that at all universities the municipal traffic police have jurisdiction over the campus roads although they are private property. In practice however they only come onto these roads if invited to do so, as in the case of a serious offence (such as a recent hit and run accident at UCT).

7.9.4 Sanction

If a person to whom a traffic ticket has been issued denies guilt, he can appeal to the Principal directly or, if such a body exists, to the university's Traffic Court. "The functions of the Traffic Court are to consider applications for the remission of fines and to make recommendations to the Rector (Principal) or his nominee."(115) The Traffic Court is appointed by Council or the Principal, and always includes members of the Law Faculty and of the SRC.

Fines differ from campus to campus. At UCT they range from R3 for parking in a loading zone, through R5 for failing to obtain a parking token, to R10 for failing to obey the

instruction of a traffic officer. At UStell, failing to register a car carries a fine of R50.

What are the chances that a ticketing will result in a fine being paid? To solve the problem, apparently of serious proportions at UCT,(116) of offenders who do not pay the admission of guilt fine and do not attend the Traffic Court when summoned, that university's Traffic Committee agreed to add to the Traffic Court Rules a clause the effect of which would be to prevent that offender from writing any examinations or receiving any examination results until he has paid the fine.(117)

7.9.5 Powers

Under what powers may a university frame and enforce traffic regulations? To take UCT as an example :

- i) Students. The University of Cape Town Act (No. 38 of 1959) enables the University to discipline students.(118)
- ii) Staff. "The traffic rules are not at present legally effective against staff." It is therefore recommended that "regulations be framed in terms of . . . the Universities Act (No. 61 of 1955) to make them effective."(119)

7.10 PEDESTRIAN MOVEMENT ON THE CAMPUS(120)

7.10.1 Problems of conflict with vehicles

Major pedestrian flows move from building to building in the short period (usually ten minutes) between lectures. See Photos 21 and 22.

Predicted pedestrian movement on the campus is a major determinant of the size and form of the recently planned campuses of RAU and UPE.(121) The separation of the vehicle and pedestrian traffic is a recurring theme.

The older campuses, particularly those with public streets crossing them(122) have a problem which is, in most cases, far from resolved. UPret has over the years purchased considerable land-holdings immediately to the east of the original campus. The stage was reached some dozen years back when it became imperative that academic facilities be built on this land. The obstacle was Roper Street. "Die Roperstraat-probleem dreig om die grootste enkele struikelblok te wees by die voorgestelde uitbreidingsplanne. Dit is ondenkbaar dat die uitgebreide kampus in twee helftes gesny word deur 'n besige verkeersaar."(123) A consultant was appointed to report on the closing of Roper Street ; he reported that this could be done without too much inconvenience to the present users, who were mostly universtiy staff and students



Photos 21 and 22 : Pedestrian flows, UCT.

anyway, and he proposed alternative routes.(124) The first physical step taken by the University authorities towards a solution is the 1977 completion of the Human Sciences Building. No suitable site on the original campus could be found for this new building, so it would have had to be located on the eastern side of Roper Street, entailing up to 2 000 pedestrian crossings every 45 minutes.(125) This was clearly unacceptable. However the municipality refused (and still refuses) to consider the permanent closure of the street. The solution therefore adopted, with the consent of the municipality, was to build straddling the street,(126) setting an interesting precedent of air rights development of university buildings over public streets.

The proposed King George V Avenue deck at UND is a perhaps more ambitious but less concrete example of similar thinking.

Even campuses without public streets have vehicle conflict problems but, with all due respect, these are of far lesser magnitude, as the traffic tends to be much lighter, slower moving, and more amenable to university discipline. UCT for example refers to a "dangerously high level of pedestrian/vehicle conflict" on University Avenue. "During the middle of the day there is constant competition between pedestrians and vehicles."(127) (See Photos 23 and 24.) It is proposed that this problem "be overcome by the exclusion of all vehicles (except perhaps buses) from University Avenue."(128) An opinion survey revealed "significant support" for the proposition that University Avenue should be reserved for pedestrians.(129) This proposal has not yet been accepted by the University. The other source of pedestrian/vehicle conflict at UCT occurs where bus passengers alight and have to cross the peripheral road. See Photo 5.

7.10.2 Problems of topography.

Only two campuses have these problems, viz UND and UCT.

To consider UND first. "One very important feature of the campus centre as it was established during the years prior to 1972 is the fact that its longitudinal axis is comparatively level. Pedestrian communication along the length of the campus is thus relatively easy. Communication across the ridge, however, everywhere involves rising and falling ground."(130) This was a major inhibitor to expansion until the 1973 completion of the Shepstone Building which for the first time exploited the steep western slopes as a building site.

An interesting precedent was established with the construction of this building. The main students' parking area is situated some 25 metres below the level of the crest, at the foot of the Shepstone Building : before the construction of Shepstone, the use of this parking area was restricted to the more athletic students.(131)

This has now changed, not simply because of pressure on other parking facilities. "To encourage maximum use of this parking area , a series of escalators was incorporated within



Photos 23 and 24 : Pedestrian/vehicle conflict, University Avenue, UCT.

the design of the transverse stairway which connects the various levels of the Shepstone Building. The effect of this was virtually to transform its main east-west corridor system into a transverse campus "street" which passes through the building and forms a direct connection between the top of the ridge and the car-parking facilities and future buildings below. The experience gained to date suggests that similar mechanical aids will be needed on all the principal cross-traffic routes . . . where the rise is very sharp and where large numbers of pedestrians will be involved."(132)

No suggestion has yet been made for similar assistance to pedestrian movement at UCT (upper campus), but the planning proposals for the University's middle campus suggest "an active and sheltered footway routed through buildings with escalator assistance."(133)

7.11 ANTICIPATED DEVELOPMENTS

This Section(134) abstracts the answers received in the questionnaire to the enquiry : "What can you tell me of the University's plans to control transport on the campus in the next few years? "

Correspondents were also asked if they had anticipated the student and staff reaction to the proposed developments, to which the general reply was that, understandably, persons who would lose presently-held privileges or would have to pay more for them would be expected to object. As UStell put it, it is expected that further restrictions will be "grudgingly accepted." In so far as improving facilities at no extra cost is concerned, this would of course be welcomed. Only UDW reported actually having done a survey to test feelings in regard to proposed changes – a poll on price increases for staff parking returned a "negative" verdict.

All campuses stress that parking areas, especially the more central ones, are progressively making way for building development, and that these will be replaced on the periphery where space permits. This will inevitably lead to a widening of the categories of students or staff who may not bring cars to the campus, and an increase in (or imposition of, at UND and UPret, where fees are not charged) parking fees. Mostly, these proposed increases are nominal ; only UStell is so bold as to state that "the way of thinking is that a realistic fee, based on the real cost of providing and controlling parking, should be charged."

Both UStell and PUCHO are contemplating "provision of a single floor or part thereof of parking in new faculty buildings." RAU state that (translation) : "Zoning for multi-storey parking garages is shown on the long-term development plan. It is an open question whether they will ever be erected."

UStell are considering abandoning the "individual reserved bay" principle presently

in use, in favour of "hunting licences" to ensure more intensive use of available parking. Most campuses intend to increase their force of traffic officers. All campuses, except the two new campuses (ie. UPE and RAU), include the possibility of a change to their internal road layout. UStell alone confesses to be considering a deliberate restriction of growth of academic activity on the campus in the intermediate future. UND propose a completely new main entrance to the campus, from Francois Road in the west : "This may eventuate in 1978/ 1979."(135) Only UCT have seriously considered the deliberate re-arrangement of lecture times in order to achieve a more spread utilization of transport (and lecture) facilities.(136)

Finally, whereas only three campuses (UCT and UStell, with UND "in progress") have undertaken transportation studies, it is extremely gratifying to note that a further four campuses, viz UWC, UOVS, UPret and PUCHO, intend to commence such a study "in the near future."

7.12 FINANCE (137)

The expenditure of a typical RSA university can conveniently be considered to be of two types.

7.12.1 Running costs

A central government subsidy (a direct grant) is made annually to each university according to a formula based on the numbers of students, staff-student ratios, and several other factors.

The normal running costs of the university (salaries, printing, maintenance etc.) are met from an income which is derived approximately in the ratio 20:80::fees:the government subsidy mentioned above. The proposed distribution of this income is the subject of an annual budget. Small works to do with transport, eg. construction and maintenance of parking lots, sidewalks and bus shelters, are paid for from the "Roadworks" vote.

7.12.2 Capital works

Capital works are funded from loans, raised on the open market, which are then serviced (interest and redemption) in a fixed ratio of funds raised by the university (usually bequests or tax-deductible grants from private enterprise) to government grants.(138) Note that the prior approval of the Department of National Education is required to the raising of the loan, which means that its officials have first to be convinced of the need, in competition with other requests made of the Department.

The subsidy ratio is 15:85 in the case of teaching and sports facilities, halls of assembly, libraries, administrative buildings and major roadworks. It evens to 50:50 in the case of residences for students or staff.

The universities always endeavour to include some parking in the "site works" for new buildings, in order to save on the precious running costs budget. Whereas the covered parking in UWits' Senate House was treated as part of the cost of this multi-purpose building, it is doubtful if a single-purpose multi-level parking structure would qualify for such a favourable subsidy. Although there has as yet been no "test case", the general feeling among the persons with whom I have spoken is that there is presumably a point at which the central government would regard a building to include "too much" parking in relation to academic space to receive the 15:85 subsidy.

7.13 DECISION-MAKING

7.13.1 Formal processes of decision-making(139)

Relatively minor decisions, eg. the addition of one or two buses to the campus service, or minor roadworks, are, provided they can be funded from within the funds budgeted for the purpose, delegated to university officials.

The realisation of recommendations by university officials which require decisions on matters of principle or are likely to involve a serious conflict of interests, but do not fall into the "capital works" category, requires different treatment. To take for example the implementation of recommendations agreed upon by the traffic consultants and Planning Unit at UCT. The path of approvals winds through the Traffic Committee (a sub-committee of the Building Committee), the Building Committee itself, the University Council, and the Senate. Progress to each step requires approval from the step preceding it. Certain decisions are delegated by Senate to the Buildings Committee.

Recommendations involving central government expenditure require a further level of approval, as described in the preceding sub-section.

There is no student representation on the Building Committee of the University of Cape Town, the chairman of which is the Deputy Principal.(140) The Traffic Committee, by contrast, is constituted as follows :

Chairman : Member of Senate, nominated by Council.

Two members of Senate, nominated by Senate.

One member of Council, nominated by Council.

Three members nominated by Staff Association.

Three students nominated by SRC.

Director of Planning Unit or his nominee.

Plus by standing invitation :

Deputy Registrar (Student Affairs).

Principal Administrative Officer (Buildings and Services).

Senior Administrative Officer (Buildings and Services).

Chief Traffic Officer.

Traffic Clerk.

Other universities have similar formal processes of decision-making on transportation and building matters, with or without student participation.

7.13.2 Student participation

Student participation, whether formally or as an informal pressure group, in decision-making on matters affecting transportation has had a chequered history.

UCT has, to the best of my knowledge, seen more action than any other campus. Back in 1972 the SRC recommended that the parking tariffs for all users be increased to raise funds to build a multi-storey parking block and to cover "the cost of free and frequent transport between the campus and the Main Road."(141) (At the time, bus fares were charged.) Another motion asked for an end to staff-student discrimination in parking.(142)

Less even-tempered was the 1973 "red baron" episode. Partly as a result of the 1972 moves described above, radical changes to the parking arrangements at UCT were proposed, and accepted by Council with support of the Staff Association and the SRC. Parking tariffs would be raised in order to finance "a bus service to operate at no charge between the main campus, Mowbray Station and Rondebosch Fountain."(143) This was blocked by a mass meeting of staff. As a result, the SRC called for "effective student action."(144) This entailed the recommendation to "ignore your ticket or summons . . . Throw tickets and summonses (yours or any you can rip off) in the special dustbin on Jammie steps for shredding and delivery to Admin."(145) This injunction was signed by the "red baron."

For the record, "free" bus services were introduced in 1974, but 60 percent of the necessary revenue was raised by a levy on each student(146) and only 40 percent from parking tariffs.

Student participation at the present time in the Traffic Committee at UCT was described in the preceding sub-section. Recently the SRC supported the Traffic Committee's idea that it be made mandatory in 1978 for first year students to use the relatively remote nor-

thern parking area; it was further reported that "the SRC had, under protest, agreed to the proposed increase in 1978 in the student levy in view of the improved bus service offered."(147) Clearly, student/authority relations, at least in respect of transportation matters, have reached a new level of understanding.

The problems are greater at a university where there is no effective channel such as a SRC for student grievances. The students at UDW claimed that a SRC would be ignored by the authorities, so why have a SRC? When a body of students went to the university administration to ask for a university-sponsored bus service, to improve the present difficult conditions,(148) the administration said "form a SRC, and then we can talk." So nothing got done.(149)

CHAPTER 8

ANALYSIS OF RSA DATA, AND COMPARISON WITH FIRST STUDY

In the previous chapter, the results of the 1977 questionnaire survey were presented with a minimum of analysis and commentary. In this chapter, the results of the 1977 questionnaire survey are further analysed and are compared, where possible, with the results of the first study.

8.1 MODAL SPLIT OF ARRIVAL ON CAMPUS

8.1.1 Trends

The only modal split available from former years is that of the 1970 Transport Survey at UCT.(150) The comparison between the 1970 split and that of 1974 (abstracted from Table 4) is shown in Table 7. Whereas there appears to be no significant change in the total number of persons arriving by car or motorcycle, there are important changes in the more detailed split, viz

- the percentage of car drivers has increased, in conformity with the general increase in prosperity of the campus population ; no doubt the relative increase in postgraduate numbers has some influence too ;
- the percentage of car passengers has decreased ; and
- the percentage of motorcycle riders has increased, thus providing evidence of the halting of a downward trend in the use of two-wheeled transport.(151)

The percentage of hitchhikers has fallen from 9 percent(152) to 6 percent (Table 4). Some of these(153) probably now use the bus. The drop in "walk" and the corresponding increase in "bus" would suggest that whereas many of the 1970 generation of students walked up the hill, their successors in 1974 now catch the bus. (Many of these students are resident in the university residences along Main Road, at the foot of the hill.) This supposition appears to be confirmed by the findings of the 1976 bus patronage survey.(154)

Remember that Table 7 reflects 1974 data, and that 1974 was the first year of the "free" bus service. The service has improved since then, and patronage has increased ; it would be interesting to see which mode has suffered from inroads made by the buses.

TABLE 7

MODAL SPLIT AT UCT : 1970 and 1974

| Mode | 1970 | | 1974 | |
|---------------|---------|-----|---------|----|
| | Percent | | Percent | |
| Car driver | 31 | | 42 | |
| Car passenger | 33 | 68 | 20 | 67 |
| Motorcycle | 4 | | | |
| Pedal cycle | — | (a) | 5 | |
| Bus | 3 | | 12 | |
| Walk | 26 | | 16 | |
| Other | 3 | | 5 | |
| Total | 100 | | 100 | |

Notes :

Staff plus students ; campus residents included.

(a) Part of "other."

8.1.2 Inter-campus comparison

Referring again to Table 4, the far higher percentages of "walk" and "pedal cycle" for UStell are clearly primarily a direct result of the higher proportion of residential students (Table 3) and secondarily a result of the more stringent regulation of student car ownership. That UND has a higher proportion of "walk" than has UCT is also clearly due to the residential component on the campus. Few people cycle to UCT or UND – the hills are too steep! The high proportion of "bus" at UCT reflects the superior bus service.

8.1.3 Staff-student comparison

The bus patronage survey at UCT reported that the bus was used by disproportionate percentages of students and, even more so, of clerical, cleaner and messenger staff.(155)

The greater freedom of staff members (compared to students) at both UStell and UCT to operate and park cars, together with the greater prosperity of this group, emerges clearly from Table 4.

8.2 TRAFFIC INTRUSION AND CONGESTION

8.2.1 Traffic intrusion

Compared to 1971, of the three campuses which had "the problem of substantial traffic on public roads across their property,"(156) only UPE has solved its problem, as anticipated, by moving from its Bird Street campus. Neither UPret or UND appears to be any closer to achieving their desired solutions of closing the offending streets, Roper(157) and King George V respectively.(158)

8.2.2 Traffic congestion at entrances to campuses

The present state of congestion at the entrances to UCT(159) represents a partial improvement on the 1971 situation. This is thanks to the building onto Rhodes Drive of auxiliary lanes on the southbound carriageway immediately before the northern access to the campus and on the northbound carriageway immediately before the southern access to the campus. These however "represent an improvement to the previous situation only in that (they have) provided additional stacking area for the University-bound vehicles, thus greatly improving the situation for through traffic on Rhodes Drive itself."(160) The delays to UCT-bound cars have not been reduced.

None of the campuses have resorted to the staggering of starting time of first lecture in order to reduce congestion.

8.3 CAR ACCUMULATION

Again, the only historical data available is from UCT. Fig. 3 is a plot of the 1970 information(161) superimposed on the results of the 1976 survey. (Note – first lecture starting time is unchanged at 08h30). The only change worthy of comment is a slightly greater use of the campus in the afternoon.

Elliot has commented in depth(162) on the poor utilisation of campus facilities, not only parking facilities, of which Fig. 2 and Fig. 3 above are both illustrative and symptomatic. Reporting that he has been “unsuccessful in the implementation of a balanced timetable,” he told of a very sophisticated computerised feasibility study that was carried out at UCT by the Planning Unit.(163) A balance in “space elements” (eg. lecture facilities, parking areas) versus “time elements” (the various lecture periods) was searched for. The hope was to create a “morning community” and an “afternoon community” by rationalising lectures, tutorials and laboratory sessions. However the findings of the report were not approved by the Senate. Thus ended the first serious scientific attempt to reduce the peak load on the campus, an attempt which, had it been given a trial, would undoubtedly have been regarded as a major breakthrough in the effective management of campus transportation facilities. Instead, occasional lecture courses are being scheduled to valley periods, such as the afternoons, on an ad hoc basis, which means that the students affected have to stay on the campus for a longer time, with gaps between lectures, or, even worse, they have to leave the campus and return for the later lecture.

8.4 PARKING PROVISION

8.4.1 Trends

Table 8 compares the 1970(164) and 1977 (Table 6) figures for the ratio “legal parking spaces provided per campus person.”

Four universities, viz, UPE, UDW, RAU and UNISA have moved to new campuses, and in all cases where a comparison is possible the parking provision has, not unexpectedly, improved dramatically. Two campuses have improved their parking situation by means of a heavy parking space construction programme – the campuses concerned are URhod and UOVS. Three campuses, viz UWC, UStell and UND, have maintained their positions, ie, they have built parking areas in pace with campus population growth. UWits has fallen behind a little. But the parking situation at both UCT and UPret has deteriorated drastically in the last seven years ;

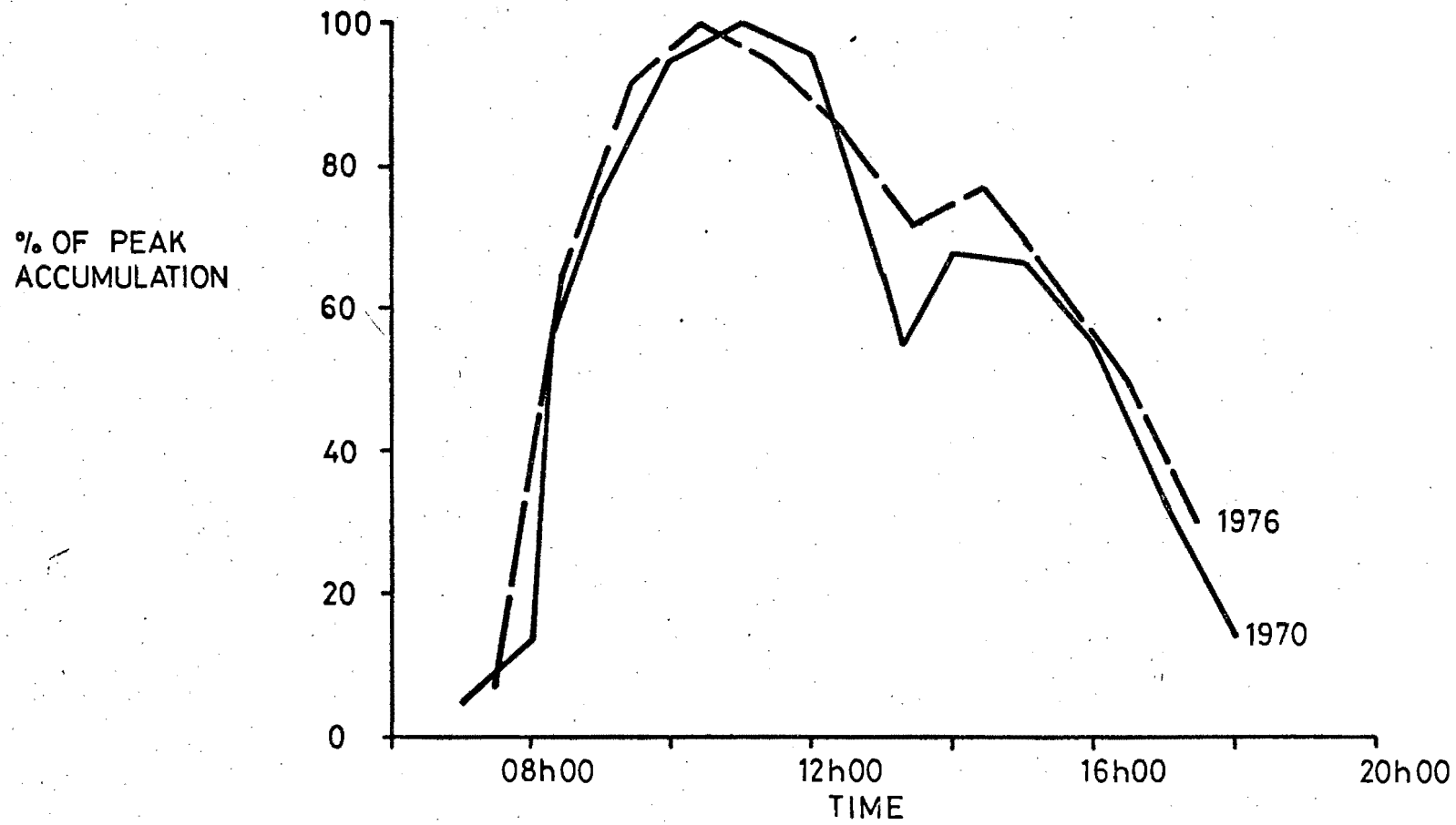


FIG. 3 ACCUMULATION OF CARS AT UCT. : 1970 COMPARED TO 1976.

TABLE 8

LEGAL PARKING SPACE PER CAMPUS PERSON : RSA CAMPUSES : 1971 AND 1977

| CAMPUS | 1971 | 1977 |
|----------------------|------|------|
| UCT | 0,30 | 0,18 |
| UWC | 0,20 | 0,19 |
| UStell | 0,15 | 0,18 |
| UPE | 0,01 | 0,26 |
| URhod | 0,02 | 0,13 |
| UOVS | 0,23 | 0,39 |
| UND | 0,21 | 0,22 |
| UDW | — | 0,21 |
| UPret | 0,06 | 0,03 |
| PUCHO | — | 0,16 |
| RAU | 0,15 | 0,31 |
| UWits ^(a) | 0,21 | 0,16 |
| UNISA | — | 0,36 |

Notes :

(a) Excluding showgrounds parking.

while campus populations have doubled, in neither case has parking supply increased by more than twenty percent. While some new parking areas have been laid out, others have disappeared under new building development. UCT at the time of the 1971 survey had the most generous parking provision of all campuses ; in 1977 the need for new parking areas is becoming urgent.(165)

A perusal of the parking plans submitted with the questionnaire returns of 1970 and 1977 suggests that distances between parking areas and campus buildings have increased marginally at most campuses, appreciably at others.

An interesting feature since 1970 has been the number of undercover parking spaces provided. Especially noteworthy is the innovation, at UND and UWits, of a total of 500 spaces within buildings.(166)

8.4.2 Inter-campus comparison

My 1971 study experience taught me that it was pointless and misleading to attempt to ascribe the change from campus to campus of one variable of the transportation scene to the change in another single variable. While the plotting of charts of one variable at a time against another could with discretion be used to discover generalised relationships, the campus transportation scene is very much a multi-variate one ; the unique circumstances of each campus make it necessary to temper every generalisation with "ifs" and "buts." For example, the calculation of an index such as "the average number of administered parking spaces per 100 persons is 43"(167) is a piece of information of no practical use whatsoever when referring to campuses with a range of populations as wide as between 1 000 and 40 000 persons. Overall data averages are in fact a positive danger, as they disguise the great range in values of the variables concerned. Rather an envelope of values, with the applicable circumstances closely defined, could be of use to a campus planner.

As Pendakur(168) has put it in what is, after ten years, still the best research paper on the subject of multiple regression analysis between variables in the field of campus transportation problems, parking demands of the campus population are determined by :

- i) Class schedules and office hours, with special reference to peak conditions.
- ii) University parking policy. "A university providing abundant space for all segments of the population will experience a substantially higher demand for parking than one which imposes parking controls on all or some segments of the population."(169)
- iii) Availability and level of service of alternative transportation modes. "At universities served poorly by public transit systems there is little alternative to the private automobile. Under these circumstances, a higher demand for parking will become obvious."(170)

- iv) University housing policies. "The number of students commuting daily to a university is an inverse function of the percentage of total student population living on campus."(171)
- v) Group-riding characteristics of commuters (ie. car occupancy ratio).
- vi) Parking fees.

Consideration of the above, supplemented by other suggested hypotheses, led to the following attempt to relate parking issues on RSA campuses to a series of other likely variables. "Parking demand" , as such, is a statistic that is not available to me, thus "on-campus parking supply" (ie. "legal parking spaces provided on-campus", from Table 6) was used instead. Note that I am **not** thereby assuming a direct relationship between parking demand and supply — the relationship between parking supply and the chosen variables is of equal interest, and is most certainly of value to transportation planners on our campuses.

To assist understanding, a chart has been plotted (Fig. 4, on the lines of Guyton and Upchurch's Fig. 5(172)) of on-campus parking supply versus campus population.

How, then, on the evidence of the available RSA data, do the following variables affect the on-campus parking supply?

- i) Lecture timetables ("class schedules") and office hours.

Self-evident. See for example Fig. 2.

- ii) Campus populationn.

Keefer and Witheford(173) suggest that relative shortage of parking space on a campus increases as its population rises. Fig. 4 certainly shows evidence of this. If one excepts UOVS, which is an outlier in respect of most variables (how a campus with the highest parking space ratio of all (Table 6), can describe its parking supply as "inadequate" is beyond me ; UOVS will be omitted from further consideration in this section), and also UPret, which has very unique circumstances (to be highlighted on the next few pages), there appear to be two groupings of campuses. The first group funnel into a parking space ratio of 0,30 to 0,15 on-campus spaces per person. The second group (of larger campuses, viz UStell, UCT and UWits) display a tailing off in supply to the range 0,20 to 0,15 oncampus spaces per person. The decline seems to set in as the campus population approaches 10 000. Pendakur found from his surveys of Canadian universities that a campus population of approximately 10 000 marked the stage at which university authorities tended to charge significant parking fees for the first time(174) and allowed parking space ratio to fall to a new, lower, standard.(175)

ON-CAMPUS PARKING SUPPLY i.e. "LEGAL PARKING SPACES ON CAMPUS"

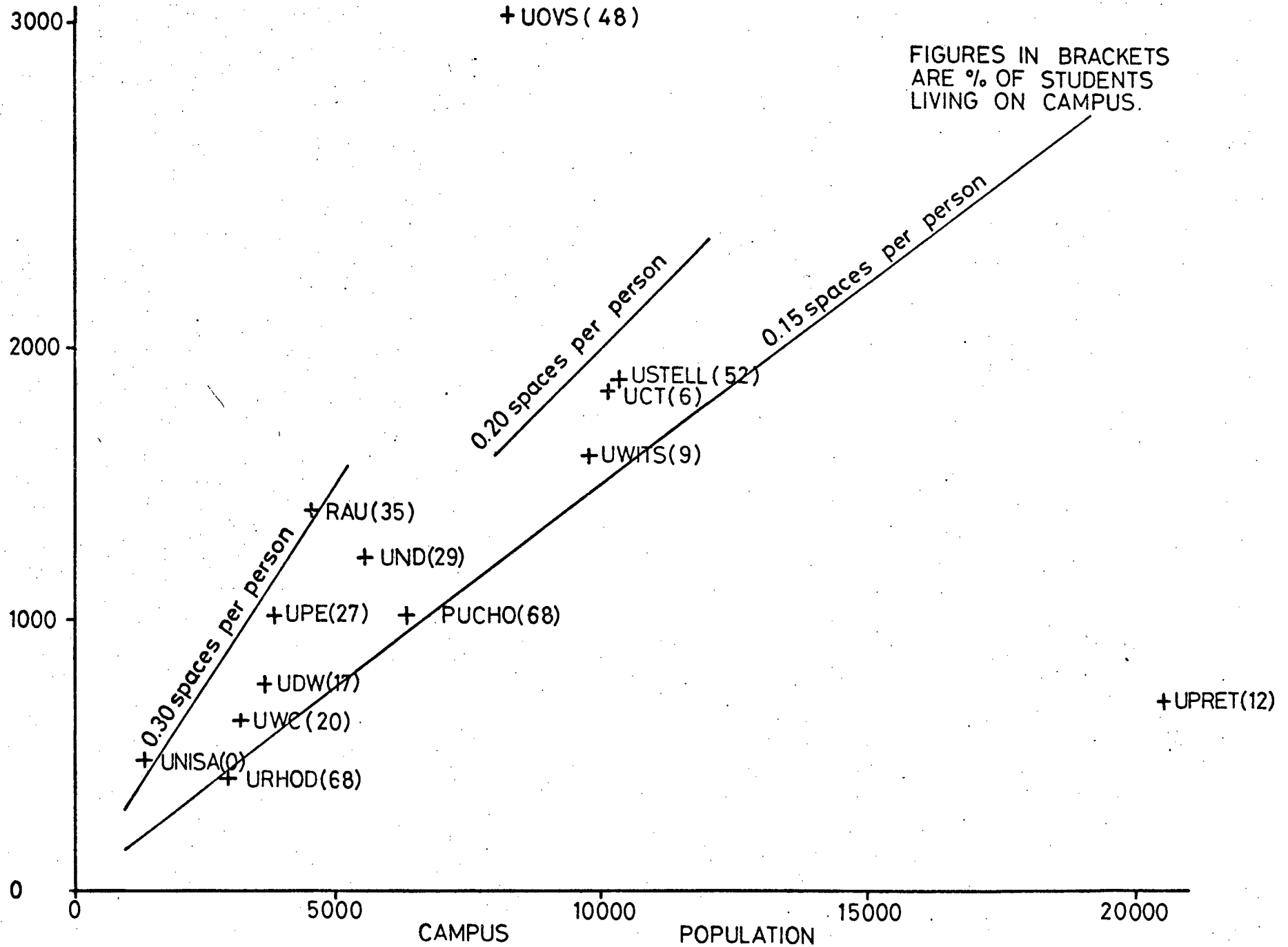


FIG. 4 PARKING SUPPLY VERSUS CAMPUS POPULATION : ALL RSA CAMPUSES.

iii) Age of campus.

Significant. The campuses best off are those planned from scratch in the sixties, viz, UNISA, UWC, UDW, UPE and RAU.

iv) "University housing policies."

This is most conveniently expressed, and shown on Fig. 4, as "percent of students living on-campus." It is not possible to see any direct relation between on-campus parking supply and percent residents ; even allowing for the addition of off-main-campus official university residences where they exist (principally UCT and UPret), too many other variables intervene. However the truth of Pendakur's statement above about commuting as an inverse function of percent residents is self-evident (UStell, PUCHO and URhod are the best examples) and is not disputed.

v) Staff as a percent of population.

Clearly important in the case of UNISA which is all staff, and has the highest parking space ratio (the outlier of UOVS excepted). This single factor explains many of UNISA's apparent wayward tendencies. Staff percentages on the other campuses are too close together (see Table 3) to discern a pattern.

vi) Population of urban area.

The University Facilities Research Centre (UFRC) state that understanding of "parking programmes" is aided by the generalised separation of universities "into two distinct categories — those in urban universities resulting from large numbers of . . . local residents living some distance from the campus ; and those in small town universities where a great proportion of the enrollment lives within walking distance of the campus."(176) Three of RSA campuses, viz, UStell, URhod and PUCHO are in "university towns" where the students form a significant proportion(177) of the town population. All three provide parking to the lesser values of the parking space ratio. They also have the highest proportion of campus residents. It would seem therefore that the UFRC suggestion has some potential.

vii) Available legal space on-campus.

The very existence of a parking problem no doubt reduces the apparent demand ; the latent demand remains however, and will be realised with any sufficient improvement in the parking supply. It is not possible to demonstrate the general validity of this statement with the data available but it is included for the sake of completeness. For this reason, among others, predictions such as that of a 125 percent increase in parking

demand at UCT, between 1970 and 1980, made in 1971,(178) could not come to pass because circumstances could not permit them to come to pass.

viii) Available off-campus parking space.

Parking on public streets across or near to the campus, or on nearby off-street parking areas not belonging to the university, is referred to here. All of the campuses in the lower range of the parking space ratio rely heavily on this parking. I refer to UStell, URhod, PUCHO and UND in respect of public streets, and UWits in respect of streets and also the showgrounds parking area. UCT is a lesser case only because the campus is rather isolated from public parking. UPret is the campus that depends the most on off-campus parking ; its almost total reliance on off-campus facilities accounts for its outlier position on Fig. 4.

ix) Restrictive parking policies.

UPret again is the outstanding example ; none, apart from a relatively small number of staff, may bring their car onto the main campus. For the rest, only UStell can be said to have a significantly restrictive car ownership policy.(179)

x) Available alternative modes.

Reviewing Table 5 and bearing in mind also the substantial contributions made by indirect public transport services at UPret and UWits, it is clear that three of the four biggest campuses, viz UCT, UWits and especially UPret rely on mass transport to bring significant numbers of their campus populations every day. (The fourth of the largest campuses, viz UStell, has, by reason of its residential policy, the bulk of its students within walking distance.)

xi) Car occupancy.

No data are available.

xii) Parking fees.

As yet, no campus charges fees which are high enough to act as a disincentive to student parkers. Higher fees are charged to some staff, but, as Pendakur points out, student parking demand is more influenced by the fee structure than is the demand by staff, "since this latter group is more capable of paying."(180)

xiii) Location of campus within the urban area.

Several campuses, for example UND and UStell, have in the last two decades considerably increased their landholding at reasonable cost, thanks largely to slum clearance schemes. Other campuses, such as UWits, have not been in a position to make significant additions, and the resulting cramping shows in the falling provision, as the years go by, of land-extensive uses such as parking.

The vagaries of Fig. 4 may now nearly all be explained. How is it, after all, that UCT, UStell, URhod, PUCHO, UWits and especially UPret are able to survive with parking space ratios of less than 0,20, ie. 1 space per 5 persons? It is now clear that they depend, each to a greater or lesser extent on —

- students (whether in official university residences or not) living close enough to the campus to walk there ;
- off-campus parking , and
- mass transit as an alternative mode (not in the case of UStell, URhod or PUCHO).

The newness of the campus, and, in the case of UNISA, the all-staff population, account for further divergences. UOVS remains a complete outlier.

However it must be stressed that all the factors mentioned in this Section 8.4, plus others such as topography and distance from CBD, and unmeasurables such as politics, personalities and finance, have an influence on the transportation characteristics of each campus.

Note that, although this section has dealt with parking issues as the dependent variables, the analysis employed here could and should (perhaps not rigorously, but certainly intuitively) be applied to a consideration of other variable transportation characteristics.

8.5 CONTROL

8.5.1 Prohibitions

There have been no significant changes since 1970 in respect of prohibitions on bringing a car to the campus. Nor in regulations governing the parked car, though it is interesting to note that UStell is considering abolishing the system of individual numbered bays.

8.5.2 Cost of parking

Since 1970 there has on most campuses been a complete re-think on the issue of parking cost.

Previously, parking discs were not bothered with at all, or were issued free, with the exception of only UCT and RAU. Even then, the tariff was a nominal Rand or two.(181) Discs are now almost universally required. Present tariffs for bays, whether individually reserved or in a "pool", in several cases (viz UCT, UStell, UPE, UOVS, UWits and UNISA) are in particular parking areas sufficiently high to cover the costs of control, administration and physical maintenance of the bay.

More substantial charges are made at UWits for parking within buildings, viz R40 and R50 per annum. This does not by any means cover the interest and amortization of the original construction cost. Presumably a tariff which would do this would have to approach equivalent rates for multi-storey parking garages in the CBD,(182) less the deduction of profit and an allowance for higher CBD land costs. This would certainly be of the order of R150 to R250 per space per annum. The question arises whether university authorities would impose such charges (or do they regard cheap parking as a legitimate form of increasing staff income in the face of competing employers), and whether the staff would accept such charges.

The reported remark that UStell is considering levying fees based on the "real cost" of parking is of great interest.(183)

8.5.3 Policing and sanctions

The forces of traffic officers on the campuses have all increased in size and effectiveness since 1970. There is some correlation between the policing strength and the amount of competition for parking; UCT is a good illustration of this.

There would seem to be a need on most campuses for a corresponding tightening of sanctions, perhaps along UCT lines. UCT have considered the use of a clamp (ie. "boei", as at RAU) and of a towing truck, and reported that this must be regarded as "too drastic and fraught with practical difficulties."(184)

8.6 TRANSPORTATION PLANNING; PROGRAMME, PROPOSALS, AND OBJECTIVES

The general improvement in popularity and standard of campus transportation planning since 1970, and the proposals for further studies, have already been noted.(185)

To summarise, the objectives of this planning ; where they are known,(186) are :

- i) To achieve a balance of the transportation plan with the requirements of the total plan for the campus. (This includes the requirement that it be flexible ; there are also environmental connotations).
- ii) To achieve the desired level of accessibility by selected modes of transport.
- iii) To achieve convenient and safe pedestrian movement within the campus (this is usually spelt out more specifically in terms of separation of pedestrians and vehicles.)
- iv) To achieve convenient and safe vehicle movement over the appropriate portions of the campus (this implies no conflict with non-university traffic).
- v) To achieve, aided by efficient management, a balance between parking supply and demand.

The first of these objectives is the most important, and qualifies all the others.

In practical terms, all the campuses seem to have accepted that —

- for the foreseeable future at least, the current level of popularity of the car will not decrease ; and
- the ideal campus layout pattern, simply stated, has a peripheral road with fingers giving access to parking, and has vehicle-free pedestrian circulation in the centre.

The campuses have reached very different stages on their journey to this ideal ; RAU and UPE are, on their new campuses, already there, but UND can only hold it up as their ideal against the day when they have resolved their traffic intrusion problem.(187)

CHAPTER 9

ANALYSIS OF OVERSEAS QUESTIONNAIRE, AND SURVEY OF OVERSEAS LITERATURE

The purpose of the overseas questionnaire and literature surveys has already been explained.(188)

9.1 AREAS OF INTEREST

The analysis and survey will not be "across the board", but will be focussed on particular areas of interest.

The areas of primary interest were chosen after a systematic assessment of the thesis needs, identified from Chapters 7 and 8 above, and the project statement priorities of Chapter 4. In no particular order, they are :

- i) The balance between restricting car use by "stick" methods such as edict, by pricing and by congestion, and restriction by "carrot" methods, eg. convenient and cheap alternative modes.
- ii) Management of lecture timetable to reduce the peak load on parking facilities and on entry and exit conditions.
- iii) Alternative methods of allocating parking bays.
- iv) Correlation between parking supply and demand, viewed against the background of any determining factors.
- v) Disciplinary measures.
- vi) Transportation plans – objectives, resources and progress.

The above relate to Project Statements 16, 5, 15, 14, 17 and 18 respectively.

Areas of secondary interest, chosen by the same criteria leavened to allow for my personal interest in certain issues more than in others, are, in no particular order :

- i) Identification of finance sources for transportation improvements.
- ii) Level of and reasons for sanctions exercised by university authorities against car user-ship by selected student groups. How far have the objectives of these sanctions been achieved?

- iii) Relationships between transport characteristics of each campus and any determining factors. Modal split, especially trend data.
- iv) Public transport (direct buses, public buses, trains.) Especially direct buses – how frequent, what financial basis, what contribution to modal split?

The above relate to Project Statements 4, 10, 2 and 7 and 8 respectively.

9.2 THE QUESTIONNAIRE SURVEY OF OVERSEAS UNIVERSITIES

9.2.1 Introduction

Table 9 presents selected statistical information, tabulated in a comparative form, which was gathered by the questionnaire survey to Australian and Canadian universities.(189) The single reply from a New Zealand university was almost devoid of statistics, and has thus not been included.

The parking supply index is illustrated in Fig. 5, on which the RSA campuses from Fig. 4 have been replotted for purposes of comparison.

Further consideration of this Table and Figure is postponed until after a description, which follows in the next sub-section, of the unique circumstances of each university.

9.2.2 Background

If no contrary remark is made elsewhere in this sub-section, the questionnaire revealed that the following were non-existent or negligible :

- i) University cars parking on public streets.
- ii) Non-university traffic intrusion onto campus.
- iii) Nearby public bus services.
- iv) Nearby commuter rail services.
- v) Restrictions on student car ownership.
- vi) Campus traffic police with power to impose fines.

In every case, the direct buses are fully economic ; they are run by the local transit authority and fares are charged ; there is no subsidy from the university authority.

The universities were established on their present campuses prior to 1960 except in the case of La Trobe (1967), Macquarie (1967), Monash (1961), York (1965), Calgary (1960) and Brock (1964). These latter campuses have more generous parking space standards ; they

TABLE 9
SUMMARY OF CAMPUS INFORMATION : OVERSEAS UNIVERSITIES

| UNIVERSITY | | | | POPULATION | | | PARKING | | | BUS | | MODAL SPLIT (Percentages) | | | | | Supple- mentary infor- mation sources | |
|------------|---------------------|------------------------|--------------------------|------------------------|------------------------|-------------------------|---|--|--|----------------------------|--------------------------|------------------------------|--------------|---------|------------------|------|---|---------------|
| Country | University | Main campus in : | Urban area size code (a) | Full-time students No. | Staff % resi- resident | Total Campus population | Legal parking spaces provi- ded on campus | Peak accumu- lation of cars on campus and public streets | Legal parking spaces per campus person | Public bus service nearby? | Direct bus (no. per day) | Car driver | Car Pass (b) | 2-wheel | Public transport | Walk | | |
| Australia | Australian National | Canberra | City | 2 300 | 48 | 2 800 | 5 100 | 2 450 | 2 750 | 0,48 | No | 4 | 54 | 16 | 3 | 2 | 25 | (190) |
| Australia | La Trobe | Melbourne | Metro | 2 010 | 12 | 500 | 2 510 | 2 000 | 1 700 | 0,80 | Yes | 5 | 46 | 24 | 7 | 8 | 15 | (191 and 192) |
| Australia | Macquaria | Sydney | Metro | 2 020 | 0 | 1 180 | 3 190 | 1 500 | 1 300 | 0,47 | Yes | 45 | — | — | — | — | — | (193) |
| Australia | Monash | Melbourne | Metro | 8 010 | 6 | 2 210 | 10 220 | 4 600 | 4 800 | 0,45 | Yes | 80 | 48 | 31 | 3 | 8 | 10 | (194) |
| Australia | New England | Armidale, N.S.W. | Small town | 1 890 | 78 | 1 030 | 2 920 | — | — | — | No | 10 | — | — | — | — | — | (194) |
| Australia | Sydney | Sydney | Metro | 12 980 | 10 | 1 420 | 14 400 | 1 020 | 1 170 | 0,07 | Yes | 0 | — | — | — | — | — | |
| Australia | Western Australia | Perth | City | 4 980 | 16 | 1 400 | 6 380 | 1 790 | — | 0,28 | Yes | 2 | 54 | 14 | 5 | 7 | 20 | |
| Canada | Alberta | Edmonton | City | 18 300 | 13 | 5 000 | 23 300 | 5 100 | — | 0,22 | Yes | 350 | 35 | 4 | 0 | 32 | 29 | (195) |
| Canada | British Columbia | Vancouver | City | 20 000 | 17 | 5 000 | 25 000 | 8 700 | — | 0,35 | Yes | > 200 | 36 | 36 | 1 | 10 | 17 | (196) |
| Canada | Brock | St Catharines, Ontario | Town | 2 210 | 18 | — | — | — | — | — | Yes | — | — | — | — | — | — | |
| Canada | Calgary | Calgary | City | 9 230 | 7 | 2 400 | 11 630 | 4 600 | 4 600 | 0,40 | Yes | 120 | ← 78 → | 0 | 9 | 13 | | (197) |
| Canada | Guelph | Guelph, Ontario | Town | 6 560 | 47 | 1 570 | 8 130 | 2 070 | — | 0,25 | No | 20 | ← 38 → | — | — | — | | |
| Canada | Lakehead | Thunder Bay Ontario | Small Town | 3 000 | 17 | 450 | 3 450 | — | — | — | No | 120 | — | — | — | — | — | |
| Canada | Laval | Quebec | City | 14 795 | 23 | 3 995 | 18 790 | 10 330 | 6 200 | 0,55 | Yes | 30 | 45 | 29 | 1 | 4 | 21 | |
| Canada | McGill | Montreal | Metro | 14 670 | 11 | 5 910 | 20 580 | 1 385 | — | 0,09 | "Very good" | 0 | — | — | — | — | — | |
| Canada | Manitoba | Winnipeg | City | 13 380 | 9 | 2 550 | 15 930 | 4 200 | 3 460 | 0,26 | "Very good" | 200 | ← 68 → | 0 | 22 | 10 | | (198) |
| Canada | New Brunswick | Fredericton | Town | 4 990 | 29 | 1 200 | 6 190 | 1 785 | — | 0,29 | No | 0 | — | — | — | — | — | |
| Canada | Notre Dame | Nelson, B.C. | Town | 540 | 80 | 70 | 610 | — | — | — | No | 6 | — | — | — | — | — | |
| Canada | Ottawa | Ottawa | City | 8 100 | 10 | 1 900 | 10 000 | 1 580 | — | 0,16 | Yes | 0 | — | — | — | — | — | |
| Canada | Queen's | Kingston | Town | 7 530 | 31 | 2 720 | 10 250 | 1 620 | 1 130 | 0,16 | Yes | 110 | 20 | 13 | 5 | 6 | 56 | |
| Canada | Saskatchewan | Saskatoon | Town | 9 800 | 6 | 1 870 | 11 670 | 2 220 | — | 0,23 | Yes | 20 | — | — | — | — | — | |
| Canada | Western Ontario | London | Town | 14 020 | 20 | 2 870 | 16 890 | 4 570 | 4 420 | 0,27 | Yes | 35 | — | — | — | — | — | |
| Canada | Winnipeg | Winnipeg | City | 3 200 | 4 | — | — | — | — | — | "Very good" | — | — | — | — | — | — | |

NOTES

- a) Urban area size code —
Metropolitan conurbation.
City > 250 000 pop.; not part of conurbation
Town > 50 000 pop.; not part of conurbation
Small town < 50 000 pop.; not part of conurbation

The information on this Table is in most cases dated 1971, and in others 1970 and 1972.

- b) "Car passengers" includes hitchhikers.

ON-CAMPUS
PARKING SUPPLY
i.e.
"LEGAL PARKING
SPACES ON CAMPUS"

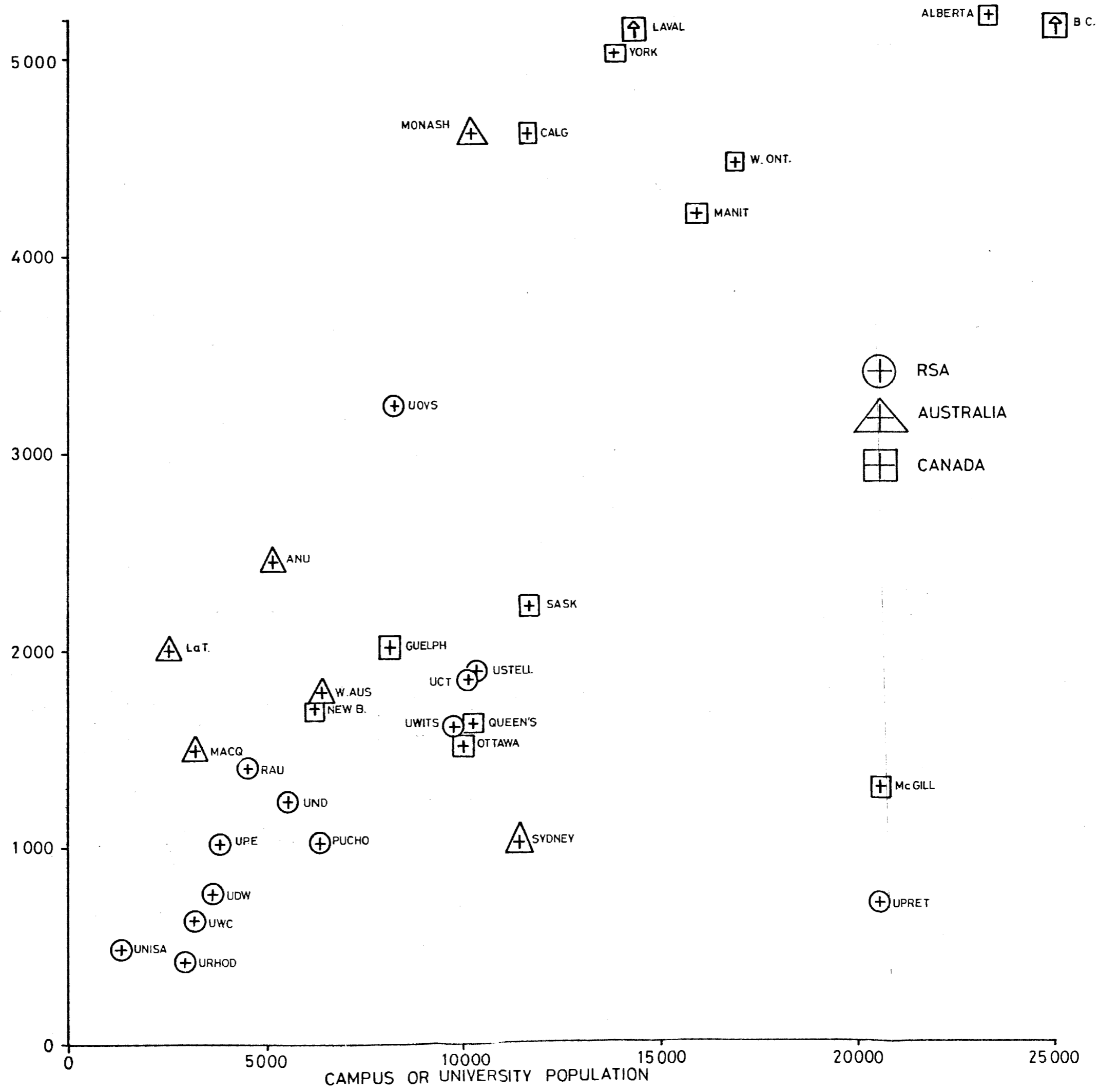


FIG. 5 PARKING SUPPLY VERSUS CAMPUS POPULATION : RSA, AUSTRALIAN AND CANADIAN UNIVERSITIES.

include the campuses with the highest and fourth, fifth, sixth and seventh highest rates of provision, which is a clear demonstration of how little common ground there really is, in respect of transportation problems, between universities on cramped downtown locations and those which have recently been established on generous suburban campuses with a full awareness of the voracious land demands of the car. The only two gaps in the sequence, viz the second and third places, are filled by two universities which, if a little older, are nevertheless fairly recent, viz Laval (1950) and Australian National (1948) respectively.

Several universities have been established for many years on campuses which are now within or close to the CBD's of major urban areas. These are : Sydney (commenced occupation of campus in 1857), McGill (1843), Saskatchewan (1912), Alberta (1910), Winnipeg, and Ottawa (1866). The common characteristics of these universities are good or very good public bus services nearby and intensively developed campuses with restricted space for parking.

Several universities report substantial accumulations of university cars on public streets viz, Western Australia, Sydney, McGill, Queen's, Winnipeg and Ottawa.

Only one university reports that appreciable numbers of students and staff come by rail — this is McGill, which has surface rail **and** underground stations nearby.

The numbers of buses coming onto the campus are in a few cases, particularly Manitoba, Alberta and British Columbia, quite phenomenal by RSA standards. These buses are reported to run "full" or nearly so, and their influence is shown on the modal split. My correspondence with the universities reveals however that the local transit authorities invariably run at a loss, which is made up by subsidies from community rates and taxes ; the university services usually lose less than most other services,(199) and thus the transit authorities are not unhappy to extend them as long as there is a reasonable return in terms of reduced parking requirements on the campus and increased accessibility of the campus to the student and staff community.

To sum up, the differences in parking characteristics and modal split figures of Table 9 and Fig. 5 can for the most part(200) be explained as natural consequences of :

- i) Relatively cramped long-established location of the campus close to or within CBD of major urban area, or any other position on the continuum of possibilities through to, in the one direction, location in a small town or, in the other direction, location on a relatively newer, larger and less intensively developed campus in the suburbs of the urban area.
- ii) Location in an urban area, with good public bus services (and, in the case of McGill, rail), which services generally improve with location closer to the CBD, versus location in a small town with poorer services or no service at all.
- iii) Direct bus services, the level of which seems to depend not only on the urban area

(increasing service with urban area size increase) but on the initiative of the university authorities in negotiation with the transit authorities.

iv) Residential policy of the university.

Australian universities seem generally to be smaller than Canadian, and more generous in parking provision. Bearing in mind that one expects parking provision standards to droop with increasing campus population, the universities of both nations generally provide a higher standard of parking than do RSA universities, as Fig. 5 shows. Since this cannot be explained by higher car ownership (Tables 1 and 2) or poorer mass transport in Australia and Canada (quite the reverse!), the only explanation, a quite feasible one, is a deliberately more generous parking provision.(201) This possibility would certainly seem to be borne out by the greater reluctance of Australian and Canadian universities to restrict car use by edict.

9.2.3 Planning

Transportation studies are more common in Australia and Canada than in RSA.(202)

Alone of all the universities, Manitoba is studying the "scheduling of classes", with a view "to relieve the demand on class space, not so much on traffic conditions".

Several universities (eg. Brock) have outlying campuses which are connected to the main campus by a bus available free to students and staff.

Several universities are aiming in the long-term at the freeing as far as possible of the central portions of their campuses from vehicle traffic. Macquarie has a bus-only route across the one edge of the central campus, closer to the centre than any of the parking lots. The British Columbia master plan shows the original central east-west road axis converted in 1970 into a "main mall", closed to all traffic. Vehicles now circulate on a ring road, and gain access to parking lots from this road. The core is penetrated by three bus "fingers" which terminate close to the mall, turn, and return by the same route.

9.2.4 Parking : policies, priorities, prohibitions and pricing

The formulation of a parking policy has been described as follows : "This policy has been drawn up after lengthy consultations with the constituent representatives of the Queen's community. As a result of these discussions with faculty, staff and students, it was decided that the policy, as described herein, will be implemented for the coming year. Until the present time, members of staff were issued parking permits without charge for the use of the available parking spaces on campus. At current market prices, the land for each of these parking spaces represents an investment in the order of \$2 000. The Government of Ontario has explicitly stated that it will not provide funds to universities for parking facilities. As a consequence,

universities themselves must meet the costs of maintaining and improving their own parking systems. With the growth of the University and the subsequent premium on land available for off-street parking lots, it has become necessary for Queen's University to introduce a parking system with fees and carefully defined regulations. Only by introducing such a system will it be possible to maintain orderly parking on the campus and to expand facilities with the goal of eventually providing off-street parking spaces for all who require them."(204)

Most of the universities have adopted a system of colour-coded "pool" parking areas ; only a few have an "open house" policy with no parking areas reserved. At a few universities, eg. Calgary, Alberta and Saskatchewan, individual bays can be reserved.(205) Some universities (eg. McGill and Winnipeg), because of pressure of space, allocate almost all their bays to staff and allow very little student parking on the campus. Several universities have a policy of no discrimination between students and staff ; numbered among these are Queen's, Calgary and Laval. Queen's has a system whereby preference in the allocation of parking permits is given firstly to persons living beyond the boundaries of Kingston, secondly to persons living outside of a defined central area in Kingston, and thirdly to persons living within this area.

However, most universities have a "pecking order" of priorities which is based on seniority of staff and then of students. An example is that of Alberta, where preference is accorded, in order, to senior faculty, other faculty, non-academic staff, postgraduate students, undergraduates living outside a defined zone "A" and, at the bottom of the pile, undergraduates living within zone "A". In common with several other universities, Alberta allows that "students operating a car pool will receive preferential treatment over those who do not operate a pool."(206) Nearly every university allows special priority to be given to physically handicapped persons.

Parking is sometimes denied to students who have a convenient bus connection from their residence to the campus (eg. Western Australia and Manitoba), or to first year students (eg. Western Australia).

Two universities, viz Alberta and Laval, have parking structures (respectively, two structures each of 800 spaces, and a 1 500-space underground structure on two levels). Note that, due to the extreme cold in Canada, many stalls have "electrical outlets", usually at an extra fee. Several universities in Canada have entry to reserved parking areas controlled by automatic barriers, opened by "gate cards" issued to those entitled to park there.

Williamson makes an interesting observation in respect of Alberta. He suspects that a mode shift to greater car occupancy, more car-pool and car drop-off, and heavier transit use is taking place ; he gives part of the credit to the "capacity restraint" of restricted parking availability.(207)

Pricing (remember these are 1971 or 1972 figures) varies from \$150 per annum at McGill, where space is at a premium, to "free". Normally the more convenient "pool" areas cost more than those on the periphery, and individually reserved bays cost the most of all. Calgary fees are respectively \$48 p.a., \$12 p.a. and \$144 p.a. These seem typical of Canadian universities ; Australian were typically half that. Many universities have metered bays in central locations, intended for visitors.

9.2.5 Parking : policing and sanctions

Nearly all the universities employ large forces of campus security police ; traffic control is only one of their duties. One of the exceptions is Ottawa, which reports that "the city police include campus in their patrols and issue parking tickets as warranted. Cars owned by persistent offenders are towed away on police initiative, not the university's."(208)

Towing away is a favourite means of traffic control in Canada (but not, it seems, in Australia). "Any vehicle illegally parked or abandoned in such a way as to interfere with the flow of traffic, fire routes, snow removal or normal business of the university will be subject to tow away at the owner's risk and expense. Information pertaining to recovery of motor vehicles that have been towed away may be obtained by contacting the university police department."(209) The towing charge is typically (Laval) \$15 to redeem plus \$1 per day ; if two months without paying, the university confiscates the car.

Parking fines typically range from \$2 for non-display of parking permit, to \$10 for excessive speed. (No doubt these have been considerably increased since 1971). Failure to pay the fine will result in the cancellation of parking privileges, or the withholding of examination results. Appeals may be addressed to the Parking Committee (or some such name), which typically includes the representatives of the Graduate Students' Association and the Students' Council.(210)

The above description is more typical of Canadian universities than of Australian. The latter seem altogether less geared for retribution on wayward parkers.

9.3 OTHER LITERATURE ON AUSTRALIAN, NEW ZEALAND AND CANADIAN UNIVERSITIES

9.3.1 Planning

Pendakur has pointed out that : "the widespread use of the private automobile which has had a powerful influence on city and metropolitan development has had an even more striking impact on the university campus. Although the use of automobiles by faculty and staff

has grown proportionally to use by other employee groups, the extensive use of the automobile by students has increased far beyond the expectations of campus planners.”(211) Ogden has stressed that the generally low-density urban areas of Australia(212) have “the effect that a large proportion of travel can only be accommodated by motor vehicle because of the wide dispersal of trip origins and destinations.”(213)

Reading the universities’ planning documentation, I get an impression of grudging acceptance of the “automobile”. The Brock planning document expresses the case rather dramatically. “Vehicular traffic is intrusive in a university community, disturbing its relationships and capable of engulfing the academic spirit. For these reasons, it must be treated strictly for its function of bringing people to and from campus but having no part to play on the campus. It must be channelled, controlled and contained.”(214)

The objectives of a transport plan for a university have been succinctly listed by Tindal :

- i) Minimum travel time.
- ii) Minimum conflict between pedestrians and motor traffic.
- iii) Minimum intrusion of the motor vehicle into the academic region.
- iv) Separation of short and long distance trips.
- v) A pleasant visual solution.

He adds that “the plan must be flexible at any time cross-section and dynamic between time cross-sections.”(215)

The principal features of this plan usually become, in physical terms :

- i) A pedestrian inner precinct.
- ii) A ring road surrounding this precinct, with a limited number of radial roads towards the centre.
- iii) All academic buildings within the ring road.(216)

Although no deliberate policy of lecture timetable staggering was acknowledged in the questionnaire response, it is clear that the norm on the bigger Canadian campuses is a presence of motor vehicles on the campus which is more evenly spread through the day than the typical RSA case. To illustrate, the accumulation of cars on the campus of the University of British Columbia is shown in Fig. 6.(217) Of especial interest is the mini-peak between 20h00 and 22h00, due to the presence of visitors to and patrons of the university swimming pool (open to the public), and theatre and convention facilities.

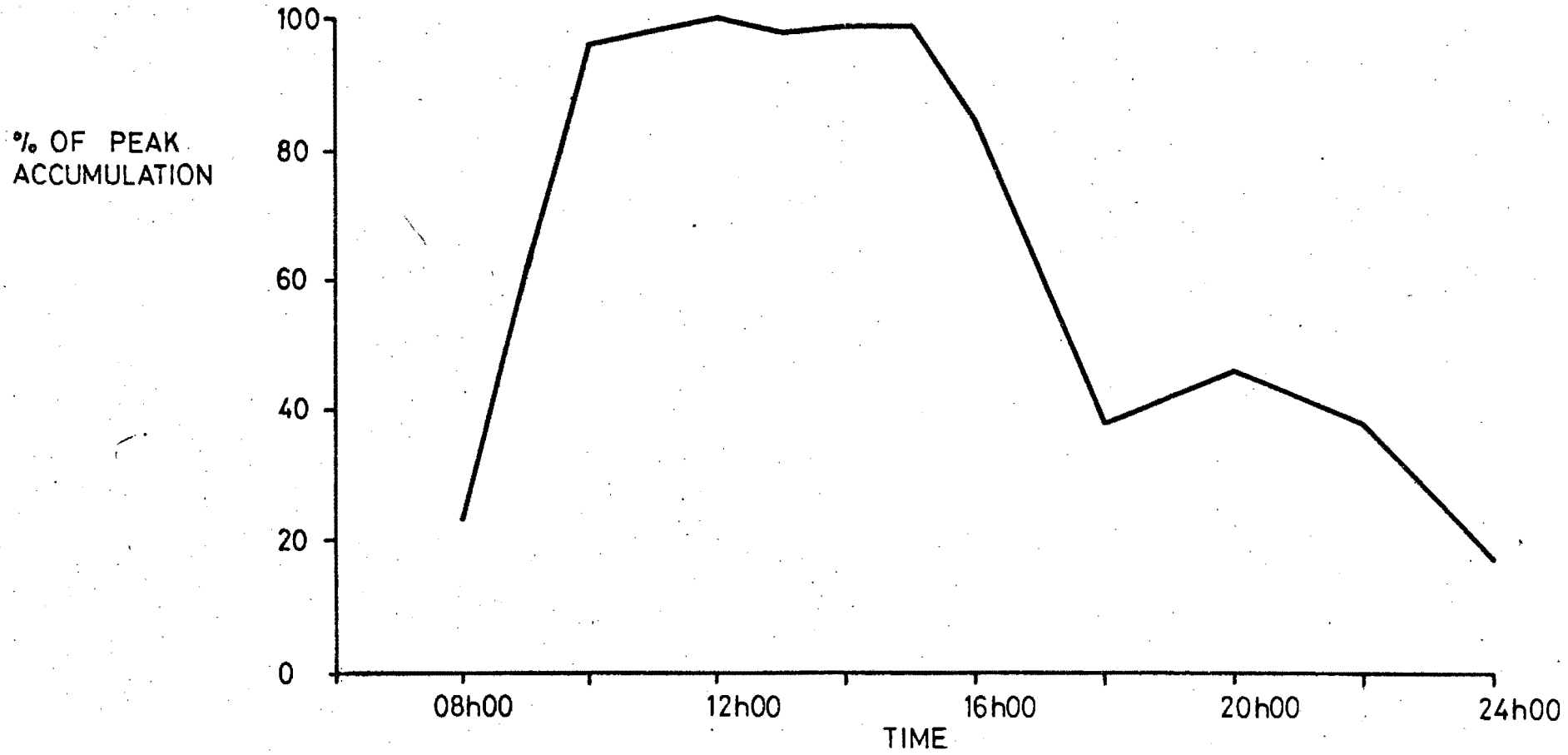


FIG.6 ACCUMULATION OF CARS ON UNIVERSITY OF BRITISH COLUMBIA CAMPUS.

9.3.2 Modal split

Ogden compares and contrasts the modal split of three universities in the Melbourne metropolitan area.(218) Melbourne University itself is located close to the CBD with its superior transport links, whereas Monash and La Trobe Universities were more recently established on spacious suburban sites. He rationalises the differences in modal split(219) as follows :

- i) As might be expected, La Trobe and Monash are closely similar. Their greater use of the motor car is primarily because "they are not particularly well served by public transport, and most importantly have adequate car parking arrangements." Also, they are located on high-capacity arterial roads.
- ii) "Public transport usage at Monash and La Trobe is again similar. Less than 10 percent of students use public transport . . . This is not surprising in view of the low residential density of the suburban areas of Melbourne.
- iii) "Walking is a much more utilized mode at Melbourne University. This reflects the fairly high density (private rental) student housing surrounding the Melbourne University campus, the comparative absence of student rental housing near Monash and La Trobe, and the somewhat higher proportion of Melbourne students who live in residential colleges."(220)

Williman points out that many students and staff members would, for convenience reasons, like to live closer to the campus but are not able to do so because of a shortage of suitable accommodation. Pointing out that this would lead to a lessening of travel, he makes the interesting observation that : "It is often suggested that public transport ought to be fostered at the public's expense so that various groups of travellers are encouraged or forced to use it in preference to their own motor vehicles. The data given here suggest that it would often be more effective to use public subsidies in other ways. Money spent on helping persons to relocate nearer to their work places, or for improving walking or cycling tracks, might be more effective than that spent on subsidies to bus operators and this matter is worthy of investigation."(221)

Tindal advocates a deliberate policy of locating residential accommodation as close as possible to teaching areas, with a view to reducing vehicle trips. He supports his contention in the following terms : "The most significant fact arising from the person trip survey and used in traffic assignment for this report is that traffic flows can be halved if student accommodation is provided within four minutes walking time of the most popular destinations. Such a provision may break the travel barrier between walking and driving."(222) This "four-minute" statistic might at first glance seem low – but see Pendakur further on in this sub-section.

Williman continues : "Taking account of home distances, it is evident that very rational choices of transport mode are made by University personnel (and students). Walking is preferred for short distances, cycling is popular for short to medium travel,(223) whilst cars or

motor cycles are used for nearly all medium to long journeys. Buses play (a lesser) part in this travel but they do carry a number of people who have no practicable alternative means of transport."(224) Ogden showed that in metropolitan Melbourne the use of public transport correlates with the availability thereof, irrespective of alternative modes.

Pendakur seems to discount these findings in favour of an apparent overriding (excuse the pun) preference for the private car. He examined modal choice by students at three Canadian universities(225) "in relation to the availability and quality of transit service and the proximity of student residential location." His findings show that, inter alia, "slightly less than one fifth of the commuting students at the University of Alberta live within 10 to 20 minutes by bus to the campus, but only one fifth of these come by bus to the campus."(226) The conclusion he comes to is that "irrespective of housing stock, its quality and availability ; and quality and availability of public transit travel time, the great majority — in fact, a preponderance of the student population — continues either as a habit or prefers to use the private automobile."(227) Further on in the same paper, in examining the reasons for choice by individual students of their housing locality, he states : "While the existence and availability of transportation (public and private) to some degree influenced students' choice of housing, it is argued here that the transportation criteria are of extremely minimal importance."(228)

In support of his theme, Pendakur reveals that, at the University of British Columbia, "impressively enough, one quarter of all students living within ten minutes of travel time continue to come by car."(229) To anticipate my next sub-section somewhat, Pendakur delivers the coup de grâce in the following terms : "Because parking fee policies at Canadian universities have never been geared to pricing and supply and demand variables, alternative means of transportation have not been attractive to the students. The administrative, budgeting and financing methods of parking at Canadian universities have made the competition and the meaningful economic choice between transit and automobile meaningless."(230)

Manitoba is more optimistic, and describes at some length how "the major aim "of bus services subsidised by the university would be "to counteract the ever increasing pressure for car parking space on the University campus." Although the services provided in the normal course of events by the metropolitan transit authority are "reasonable", because of the suburban location of the campus and the dispersed pattern of student and faculty residence areas, a really convenient bus service was available to only a small section of the University population. In 1970, chartered buses began four carefully selected routes between the campus and suburbs of high student concentration which were not easily accessible from existing transit routes. "It is intended that the Unibus system should be largely self-supporting and provide a competitive alternative to the established preference to the private car or the car pool." The statement of faith continues : "It may well be necessary for the University to continue and expand Unibus even if fare revenues are considerably less than operating costs since it may be more economical for the University to subsidise public transport rather than parking and other private car facili-

ties.”(231) To further encourage the use of buses, design criteria for the routing within the campus have been laid down, aimed to make the bus stops more convenient to the destinations than the car parking areas are.(232)

Note that “an additional objective is to increase accessibility to areas of the city where housing rentals are appropriate to students’ means but where the present transport services discourage student occupation.”(233)

A refinement : both Williman and Ogden point to the usefulness, when carrying out a detailed transportation investigation, of identifying and distinguishing between component groups whose travel characteristics differ significantly.”(234) For example, Ogden reports that females are much less likely to drive to university than males, and that “the incidence of car driving also appears to increase with the seniority of the respondent,” doubling from first year level to postgraduate.(235) Even better documented are the differences between staff and student travel characteristics. “The identifying and quantifying of such characteristics will improve the accuracy with which prediction of future traffic or parking may be made.”(236,237)

9.3.3 Parking : policies, priorities, prohibitions, pricing and policing.

Manitoba succinctly states the problem, common to so many universities, and then sketches three policy alternatives (**not** mutually exclusive).

“With increasing enrolment and diminishing resources of accessible land, new policies on parking construction, pricing and/or allocation are required. Several parking construction alternatives have been examined :

- i) Parking limitation — Future financial and physical constraints may be such that only minor changes and additions to the present parking facilities are feasible. With a growing enrolment this situation would require increasingly stringent controls on parking permits, which may be acceptable if there are substantial improvements in public transport services and campus housing.
- ii) Parking structures — Parking densities may be increased in specified areas by the construction of multi-storey parking garages and/or by including car parking floors in new academic buildings.
- iii) Park and ride — Parking construction may be continued in open lots but considerably further from the main campus area and in conjunction with major extensions of the enclosed walkway system(238) and shuttle bus services.”(239)

At the time of my 1971 questionnaire survey, only two universities of those responding had actually built multi-storey parking structures (viz Alberta and Laval(240)), but several universities expressed the firm intention of building such structures in the very near future.(241)

The costs of the various types of parking have been investigated in several reports.(242) It would seem that the annual costs per car space would be in the ratio of 2:3:7::on-campus paved surface parking lot : remote paved surface parking lot : parking in multi-storey structure.(243)

Of course there are other factors which would influence the choice of which type of parking to invest in. These would include :

- i) The inability, due to lack of space or due to environmental reasons, of the university authorities to find suitable space for further on-campus surface parking lots.
- ii) Capital shortages. (Requirement greatest for structure, relatively modest for the other alternatives.)
- iii) The ability and willingness of the patrons to pay the greater charges in order to amortise the cost of a structure.
- iv) The ability and willingness of the university authorities to subsidise one or other alternative, for whatever reasons.
- v) "One of the major disadvantages of the shuttle transit type of system is the convenience or level of service factor. The parking supply is removed from the final destination, requiring users to accept "transfer of mode" inconvenience. (This item is one of the most significant factors in declining use of many city-wide transit systems, as the dominant variable in selecting mode is **total** trip time.)"(244)

Which combination of alternatives is to be chosen for any particular campus depends on the balance, in the particular circumstances, between the influence of the factors named above.

As an aside, the marginal benefit of any measures to reduce parking demand on the campus can now be more clearly seen. Rather in the spirit of Roth,(245) Australian National points out that any reduction in spaces demanded would be at the "top end" of the parking stock, and thus of the most expensive form (probably in a structure). The proportion of the most expensive parking out of the total parking would be smaller, and thus (in the case of subsidised cost of these spaces) the cost would be less burdensome to the remaining parkers.(246)

The reports I have read all seem to have plumped in their recommendations for "the use of close-in parking", with a contribution in only one case of shuttle bus to remote lots.(247) How then have they faced the problem of financing the proposed structure parking?

Diamond and Myers state firmly that (Alberta) "University policy should be that parking is provided according to demand and that parking fees be so structured that parking will be self-supporting."(248)

Australian National devote no less than nine pages of their report to a chapter with the self-explanatory title "meeting the costs."(249) Owing to the interest that the arguments set out in that chapter must have for several RSA universities at the present time, they are, below, quoted or paraphrased at length.

Commenting on their own conclusion that a parking structure will need to be built some time in the near future, they view with a measure of alarm the present free parking situation on the campus, and hence the change in attitude to paying for parking that will have to take place in order for the campus population to accept the substantial fees that will be necessary to amortise the cost of a parking structure.(250) "It is assumed for the purpose of this appraisal that the additional cost of structured places must be met from parking fees and that the capital sum needed for building will be borrowed."(251) After a detailed analysis, they state: "Inescapably we are forced to the same conclusion as so many other universities which have aspired to the establishment of structured parking, that costs must be spread over the whole body of parkers or, in other terms, that the ground level parking must subsidise the structures.(252) The introduction of a parking charge will inevitably arouse opposition, particularly if the charge starts off at the substantial level which this assessment indicates to be necessary.(253) Early introduction of charges, ie. before structured parks are needed, would allow a period in which funds could be accumulated against the day when the parks are built. This opportunity could be used to introduce charges at a reduced rate, raising them as the annual cost builds up when further structured parks are added. Alternatively, the election could be made to enter into structures at an early date rather than wait until the supply of assigned ground level parking sites is fully committed. This would involve both earlier introduction of charges and higher charges initially, because the percentage of 'free' grade parking available to subsidise the structures would be less. Early construction could have distinct cost advantages in the present inflationary situation."(254)

The suggestion is made that one or more of the proposed parking structures, preferably located on the campus perimeter, could be provided by private enterprise, perhaps additionally attracted by some concession such as a service station.(255)

I have made little mention in this sub-section of the first of Manitoba's three policy alternatives, viz parking limitation or "prohibition", because this alternative attracted little attention in the reports. I find the omission of this alternative, of such great potential, very surprising. Only Australian National recommends that: "Parking within the inner core be restricted and available in accordance with a system of priorities to be established,"(256) and acknowledges the dampening effects on the demand for parking of "on the one hand, high fees, and on the other hand, some form of restrictive policy."(257)

The question of control modes has also exercised the Australian National planners. After discussing alternatives such as parking meters and automatic gates, the recommendation is

made for a permit system which will be the most flexible and the cheapest alternative, and will cause least delays to vehicles.(258)

Consideration of two relevant issues, briefly described, will close this sub-section.

It is important of course that parking areas are planned and allocated, where possible, in relation to the portions of the campus which they are intended to serve. An excellent example of a pedestrian desire line diagram, shown in the Manitoba report, reminds one of this.(259)

Tindal states that he has, in the New England traffic plan, applied queueing theory principles to a reduction of congestion problems. He has reached the conclusion that "a large number of small facilities create fewer problems and give better service than a small number of large facilities. This is particularly relevant to parking areas, roads and intersections."(260) He accordingly offers an optimum parking area size of approximately 130 spaces.(261)

9.3.4 Parking : provision

1971 rates of provision at the larger Canadian universities are summarised in Manitoba.(262) There are a few discrepancies, which I suspect are due to my exclusion of part-time students from the student total, compared to Table 9 of my present thesis. The rates are quoted for four universities not listed in Table 9 ; in size order, for campus population from 10 000 to 5 000, their number of parking spaces per campus person are 0,20, 0,28, 0,44 and 0,44,(263) which again tends to suggest, everything else being equal, that the larger campuses provide proportionately less parking.

Pendakur, in a study of Canadian-universities, found in 1967 that the average parking supply fell from 0,30 to 0,40 spaces per person for universities less than 10 000 total population, through 0,25 to 0,35 for the range 10 000 to 15 000, to 0,15 to 0,25 for the range 15 000 to 20 000 total population, if these universities were "auto-oriented" (which type included the Universities of York, Simon Fraser and Manitoba). "A series of interrelated factors, among them the level of service of public transport, availability of land for parking, university parking policy, number of resident students, and climate lead to these campuses being auto-oriented." However there is a second group (among them McGill) which Pendakur identifies as "public-transport-oriented." "Among the factors leading to this classification are the availability of efficient and frequent public transport service (and) central location of the campus in relation to the urban area." Their average parking supply ranges from 0,15 to 0,25 spaces per campus person below 15 000 population, to 0,10 or even 0,05 above 15 000 population. To sum up, Pendakur's evidence shows him that there is "a drastic reduction in parking needs when economic, efficient, and frequent public transport is available for all segments of the university population."(264)

The above emphasis on the influence on parking habits of the availability of public transport might appear, at first glance, to conflict with the same author's strong statements on the apparent irrelevance of public transport availability to a population which seems determined "either as a habit or (by preference) to use the private automobile." (265) My own interpretation of Pendakur's statements is that, irrespective of transit alternatives, people who possess a car will tend to use it to commute to the campus, provided there are no major obstacles to their doing so. Such obstacles could include a shortage of parking space, a parking fee which the persons concerned felt they could not afford, or a prohibition or imposed inconvenience (eg banishment to a remote parking area). However, the presence or imposition of any one of these obstacles (which obstacles could be referred to respectively as restriction by congestion, by pricing or by edict (266) **could** cause a corresponding reduction in car commuting (and hence in parking demand) **provided** there were alternative means of transportation available. As Pendakur says of his own earlier paper: "He suggested that the instrument of parking fees could be effectively used to restrain the parking demand to optimum levels in relation to the available resources of the universities, eg. land, finances and accessibility." (267) In other words, when Pendakur says that people will tend to use their cars, he is not advocating that they should be allowed to. Instead, he sees a way out of the upward spiral fight congestion by increasing car convenience / hence increase attractiveness / hence increase congestion. Therefore he advocates, bearing in mind the unique circumstances of each campus, and especially the convenience of (or lack of) alternative modes to the car, that an "optimum level" of parking availability be determined and that the various methods of restriction, particularly pricing, be introduced to peg demand to these levels.

Acknowledging therefore that "auto-oriented universities" have no real alternatives open to them, he recommends an **increase** in parking availability in the future. However for "public-transport-oriented universities," his recommended parking figures represent a **decrease** on present availability; his recommended annual parking fees are also higher than for their "auto-oriented" counterparts. (268) At the same time, he stresses the need for greater co-ordination between the metropolitan transit authority and the university authority, in order to provide the displaced erstwhile car-users who attend "public-transport-oriented universities" with a "carrot" to which they can turn when the "stick" of restrictions by congestion, pricing and edict beats too hard. At present, where it exists, the university transit service is in many cases "poorer than that to other work centres within the same community." (269)

In Table 10 are shown recommended parking space provision standards, culled from available reports, and also Pendakur's recommendations.

TABLE 10

RECOMMENDED PARKING SPACE PROVISION STANDARDS : AUSTRALIAN AND CANADIAN UNIVERSITIES

| Country | University | Year of Report | Year for which recommended | Recommended standard ; spaces per campus person | 1971 Questionnaire survey : actual | Remarks | Reference |
|-----------|--|----------------|----------------------------|---|------------------------------------|---|-----------|
| Australia | Australian National | 1971 | 1977 | 0,40 | 0,48 | | (270) |
| Australia | Griffith | 1973 | — | 0,33 | — | | (271) |
| Australia | La Trobe | 1968 | 1973 1978 | 0,35 0,36 | 0,80 | Population has lagged behind prediction. | (272) |
| Canada | Alberta | 1969 | 1973 | 0,50 | 0,22 | | (273) |
| Canada | Brock | 1966 | 1975 | 0,63 | — | | (274) |
| Canada | Calgary | 1970 | 1975 | 0,33 | 0,40 | Use was made of Pendakur's "auto-oriented" standards. | (275) |
| Canada | Manitoba | 1971 | 1975 | 0,30 | 0,26 | | (276) |
| Canada | Pendakur's "auto-oriented" | 1968 | Immediate use | 0,35 to 0,50 | N.A. | Population < 10 000 Fee < \$20 p.a. | (277) |
| | | | | 0,30 to 0,45 | N.A. | Population 10 000 to 15 000 Fee \$20 to \$40 p.a. | |
| | | | | 0,25 to 0,40 | N.A. | Population 15 000 to 20 000 Fee \$40 to \$60 p.a. | |
| | | | | 0,20 to 0,35 | N.A. | Population 20 000 to 30 000 Fee \$60 to \$80 p.a. | |
| | Pendakur's "public transport-oriented" | 1968 | Immediate use | 0,15 to 0,20 | N.A. | Population < 15 000 Fee \$40 to \$60 p.a. | |
| | | | | 0,10 to 0,15 | N.A. | Population 25 000 to 30 000 Fee \$60 to \$100 p.a. | |

9.4 LITERATURE ON UNIVERSITIES IN OTHER COUNTRIES

9.4.1 General

This literature survey will be very selective. Only the information pertaining either to areas of interest which have not yet been adequately covered, or to particularly noteworthy innovations, will be reported on.

The remark has been made that in campus transportation planning "as in so many other fields there exist problems and methods of solution common to USA and RSA."(278) The remaining overseas information, then, comes predominantly from the USA, with a lesser contribution from the UK. As a general rule, the natures of the university transportation problems of these two countries represent opposite poles of the "auto-oriented" and "public-transport-oriented" spectrum to which Pendakur refers.(279) Smaller, more-intensively developed campuses in UK, together with superior public transport availability, contrast with the generally far larger, more spread USA campuses, with the greater availability of "automobiles" to students and staff alike. There is clearly a different conception of, for example, the parking problem ; whereas USA universities worry if new permanent parking areas cannot be found, UK universities live comparatively hand to mouth, and find comfort in predictions of reduced rate of increase in car ownership.(280)

The remainder of this section will attempt to cover the mass of available information, all of it from either the UK or USA, on, in sequence :

- i) Issues of "stick" and "carrot", with which are interwoven the correlation of parking supply and demand.
- ii) Management of the lecture timetable.
- iii) Transportation planning – need for, objectives of, policy guidance of, methods of and resources devoted to.
- iv) Alternative methods of allocating parking bays.
- v) Finally, a series of planning techniques or technological measures which, although they have been pioneered overseas (some are in general use in the UK and/or USA) have yet to make significant impact on any RSA campus.

9.4.2 The balance between restriction of car use by "stick" methods (ie. by edict, by pricing, or by congestion), and restriction by "carrot" methods ; the balance between parking supply and demand.

To anticipate the rigorous explanation which follows in Section 10.4 below, parking demand, if supply and campus population are held constant, varies directly with the proportion of car drivers in the modal choice. Fink analyses the transportation characteristics of the nine

campuses of the University of California.(281) Finding that at two campuses more students walked to campus than used all other modes put together, at two campuses more cycled than by all other modes put together, and at four campuses more came by car than by all other modes put together, he seeks reasons for these dominant choices.(282) He reaches the conclusion that five factors between them determine a student's travel orientation. They are :

- i) Proximity and concentration of student housing.
- ii) Availability and quality of alternative transportation modes.
- iii) Scale and intensity of environs development.
- iv) Topography of the campus environs.
- v) Campus/community policies on student transportation.(283)

Broadening the above framework to include staff travel characteristics, the UK and USA information gathered on the question "What determines modal choice?" will now be considered.

- i) Proximity and concentration of student and staff housing.

Fink analyses campus transportation orientation against the total student housing, both university-owned and private sector, within a given radius of campus (two miles). His data show that the pedestrian-oriented campuses have the highest concentration of students living within one mile of campus, while the cycle-oriented campuses have the highest concentration of students living within two miles of campus. The auto-oriented campuses have the lowest percentage of students living within either one mile or two miles.(284) Clearly, walk is the preferred mode within one mile and cycle the preferred mode within two miles, while "the farther a student lives from campus the greater the chance he will use an automobile to get to campus."(285) Even if cars are owned by persons living close to campus, the probability that they will use their cars for the journey to campus is very low.(286)

This relationship is recognised in a 1965 Manchester report ; viewing with concern the shortage, in the face of rapidly rising student enrolment, of places in nearby lodgings, it urges that "serious consideration should be given to the possibility of speeding up the rate of provision of student places in halls of residence or hostels on the Precinct as this would cut down the number of (car) trips attracted."(287)

- ii) Availability and quality of alternative transportation modes.

It is sometimes assumed (not only in campus transportation planning but in CBD transportation planning too), that the provision of a convenient and cheap public transport service is sufficient motivation for a shift in modal choice from the car to the public transport. Pre-condition, yes ; sufficient motivation, no! The "carrot" is not sufficient ; the "stick"

must be applied to a greater or lesser degree, depending on how juicy the carrot is! As Pennsylvania complained as far back as 1964 : "If the University area is so well served by commuter railroad and public transit facilities, why the dominant and evergrowing demand for automobile accommodation? All logic aside, the public service system simply cannot compete with the favour in which the private automobile is held at the present time."(288) The University must therefore "consider appropriate means by which it can obtain maximum utility from the fine commuter and public transit facilities which serve the Campus."(289)

The University of Newcastle Upon Tyne too, has an excellent bus service through the campus. Yet 83 percent of campus population arrive by car and only 5 percent by bus.(290) Fink's California study provides further evidence. "Although a functional public transit system had been developed to serve Santa Cruz campus, most students who owned cars did not use public transit but instead used their cars to travel to campus. (This phenomenon has also been observed at each of the automobile-oriented campuses)."(291)

On the positive ("juicy carrot") side, Fink shows that the availability and quality of alternative transportation modes influenced transportation characteristics. "The only campus to develop a public transportation system specifically tailored to student needs (Santa Cruz) was the only campus where a substantial proportion of students used public transportation. The two campuses which developed extensive physical facilities for linking the campus and community by bicycle networks indeed had a bicycle orientation.(292) The four campuses most accessible by highways and large arterial roads were automobile-oriented. Finally, the campuses with easiest pedestrian access were pedestrian-oriented."(293)

iii) Scale and intensity of environs development.

This factor is "postulated to relate to campus travel in the following way : campuses with highly urbanised environs should tend to be bicycle-oriented, and campuses with an undeveloped or underdeveloped campus environs should tend to be automobile-oriented." This is found to relate not only to daily student commuting to campus, but also to trips between campus and shopping or recreation ; if these were "available in the immediate campus environs, students are encouraged to walk or bicycle to these activities."(294)

iv) Topography of the campus and environs

Fink reports that steep hills at two campuses discourage walking or cycling. By contrast, at two other campuses, "the flat terrain of the campus and its environs provides a setting hospitable to a bicycle orientation." Three other campuses are also flat, but in each case free-ways or major arterials inhibit bicycle use.(295)

v) Campus and community transportation policies.

This fifth factor could either encourage or discourage particular student travel patterns. Reference has already been made above to measures intended to improve the attractiveness of alternative modes. Concern here is principally with the regulation of car parking, and with "stick" measures, viz restriction by congestion, by edict and by pricing, to persuade car drivers to use other modes. The Highway Research Board presents case studies, outside the campus environment, of parking controls as a means of altering the traffic pattern.(296)

Fink refers to restriction by congestion. He finds that the pedestrian campuses have the lowest proportion of parking space per campus person, the bicycle campuses have a higher proportion, and the automobile campuses have the highest.(297) Unfortunately he does not have data on parking in the campus environs, the amount and availability of which would greatly affect the transportation orientations of each campus.

The effect of restriction by edict, ie. forbidding the use of cars by identifiable sections of the population, is self-evident.

Less predictable is the effect of pricing. While it is agreed that the cost of parking "becomes a substantial control variable over auto and transit usage in the modal split decision,"(298) the extent of its influence is not agreed upon. The index which could assist the prediction of the effect of a proposed parking charge is known as "the elasticity of demand for parking." I know of only one instance where this has been calculated in respect of a university; unfortunately this was not as a result of a study of a "before" and "after" situation, but was derived from the questionnaire response to the hypothetical imposition of parking charges at the University of Oxford,(299) and has the faults of all surveys which involve hypothetical decisions.(300)

Roth warns that there exists a factor of latent demand or "frustrated demand" for parking space, "ie. a demand by people who were willing to pay for convenient parking spaces but who did not even bring their cars into the survey areas because of the difficulty of finding convenient spaces. Because of the existence of frustrated demand, it was not possible to conclude that the imposition of prices would, in general, reduce the number of cars actually parked or seeking spaces. This was because the effect of price would be to discourage some of those parking at no charge, but to attract to the area some of the parkers currently frustrated, because the prospect of finding a place would be improved.(301) Figures suggest that, in the particular circumstances of the Oxford study, if all persons who did not bring a car to the campus for the quoted reason "parking difficulties" changed their minds as a result of the removal of these difficulties, and did bring a car, then staff parking demand would increase by 9 percent.(302)

Fink describes the California campuses one by one, explaining how the combination of factors unique to each campus has led to the modal split which his survey found. He stresses once more that many factors, such as car ownership, flat terrain and good public transport are **preconditions**, but **not guarantees**, of certain modal choices.(303)

In a chapter headed : "The need for balanced transportation," Fink quotes with approval a list of positive characteristics of a transportation network to be maximised and negative aspects to be minimised.(304) Prominent among those to be maximised are economy, efficiency and convenience, and mobility for all members of the population. Fink then states that a balanced transportation system must not only provide convenient access to and from the campus, a traditional concern of campus transportation planning, but it should cater for the need for access by students and staff to shopping, entertainment, recreation and other non-campus activities.(305) However neither his own study nor my present study is able to provide much "information on the magnitude of these off-campus transportation patterns and needs."(306) A series of policy recommendations which might lead to a balanced transportation system are summarised in Fink.(307)

Carter points out that climate should be added to "topography" in Fink's list of factors. While in warmer areas (such as California) with relatively flat terrain, the bicycle may be a significant mode of access during good weather, "the bicycle has limited application in colder climates."(308)

Apropos of attempts, made at several campuses, to alter modal choice, it is worth repeating that sufficient elements of both carrot and stick must be present, and that Fink's other three factors must be favourable too.

Buchanan and Partners, in their study of transportation for the Development Plan of Bath University, recognise that topography is a limiting factor ("the position of the University at the top of steep approach roads means that few people will be able to come and go on foot or bicycle."(309)) Because of the scattered student lodging (the University is on the edge of the city and therefore there is no perimeter of housing suitable for private sector lodgings) "it will be impossible to provide a bus service linking the campus to more than a few residential areas." Wisely, therefore, they admit that "considerable reliance on private cars or scooters seems essential."(310)

A British case study where, by contrast, the omens for success in inducing a modal shift appear more propitious, is Southampton University. Ryall concludes that : "Of the car journeys, 28 percent of staff and 45 percent of student journeys originated from within easy walking distance of the University, and therefore provided considerable scope for suppression by price or regulation."(311) Topography is not too unfavourable.(312) "Suppression" will be

necessary, as the planned rapid expansion of the University has already led to a saturation of on-campus and public street parking space.

Turning to the prospects of an induced swing from cars to bus, Fink sets out the pre-conditions which a bus service to the campus should fulfil in order "to maximise student interest." (313) He warns that, if a student possesses a car, and lives more than a few miles from campus, he will tend to use that car, irrespective of the economies or convenience of any public transport system, unless strong disincentives are put in his way by the university authorities. (314)

This seems to have been realised at the Amherst campus demonstration project right from the start. The purposes of this demonstration project were :

- i) To measure the effect of free bus service, increased parking fees, and associated restrictions on the use of automobiles on the campus on shift of users away from private autos to the public transport mode.
- ii) To estimate the benefits and costs of these modal shifts to users, to non-users, to the university, and to the Town of Amherst.
- iii) To measure how changes in transportation services affect community attitudes toward public transportation.

The university's ability to adjust parking policy to encourage, balance, or discourage mass transit use forms an important aspect of the demonstration." (315)

Initial introduction of the improved bus service to Amherst (the largest campus of the University of Massachusetts) was followed six months later by significantly increased parking fees on the campus. Although patronage has been higher than expected, it appears that the total number of student car drivers has been reduced by ten percent at the outside. (316)

Four universities, viz Kent State, Iowa, California at Davis, and Michigan State, are known to have bus routes covering the surrounding residential areas up to ten miles from the campus. (317) In the first two cases, peripheral and neighbourhood parking lots are also served (see Sub-section 9.4.6 below). The Kent State service has been operating since 1967 ; a financial by-product is that approximately 40 percent of the cost is returned to the student operators of the service. Experiments carried out initially showed that a "no-fare service" (actually an annual levy, paid at registration) produced a three-fold increase in ridership compared to a service with a fare collected for each trip. (318) (It also raised more revenue, was cheaper to administer, and caused no delay in the service).

In 1971, the University of Iowa began a similar operation, "designed to furnish an attractive level of service to the CBD — central campus — hospital complex area from the prin-

cipal Iowa City residential areas.”(319) Despite an apparent absence of any accompanying program of parking price increase, it is reported after a year of operation, that while most bus riders formerly walked to campus, “use of the automobile has also been changed such that about 500 automobiles have been eliminated from the central campus.”(320)

Andrews et al confidently state that : “With increased emphasis on express and local transit and reduction in priority of the auto, transit trips in the peak hour should increase from 0 percent (in 1971) to 10 to 15 percent by 1981.”(321) This appears to be based on their assessment of the “carrot” effect which a proposed transit service would have on a large number of campus commuters in a fairly concentrated area of St Paul ;(322) no assessment has apparently been made of the other of Fink’s five factors, and I therefore query the chances of success of this scheme.

Three final aspects of the “carrot and stick” argument, all with overtones of equity, will now be touched on.

Segelhorst and Kirkus discuss the questions of inequity that arise when campus parking is underpriced. Whether student or staff member, car ownership is positively correlated with one’s income (or one’s parents’ income!) If parking is underpriced, then it is in effect being subsidized ; in view of the fact that car ownership is a requirement for the use of parking, then the **higher** income persons are being subsidised! This inequity can only be redressed either by full cost pricing of parking, or by equivalent subsidies to alternative modes.(323) “The policy that firms should adopt . . . is to subsidise both transit and parking.”(324)

In an argument which is in conflict with the above, Ryall opines that student car usage should be more suppressed than staff usage. His argument is that questions of necessity override equity ; whereas suppression of student usage can be achieved without too much harm to the working of the university, “in the case of staff, suppression by cost, to be really effective, might have extremely serious consequences in terms of University-to-staff relations, perhaps out of proportion to the charges, and ultimately affect staff recruitment and retention.”(325)

Thirdly the question of captive riders, “those students (or non-academic staff) who cannot afford cars or who are forbidden their use, and who are also obliged to live at some distance from the teaching sites.” These persons “may have no alternative but to resort to inconvenient or inadequate public transport services.”(326) Fink, too, finds that the only factor compelling public transport usage was the simple fact that the students concerned did not have access to cars.(327) The moral here is that any transportation policy must not forget the plight of any group which has no choice of mode except Hobson’s.

9.4.3 Management of the lecture timetable

Management of the timetable could produce economies in the utilisation of all facilities

on and around the campus ; the tools for the computation of "optimal solutions," given the desired constraints, are available.(328) This Sub-section will briefly discuss the transportation advantages which could arise from management of the lecture timetable.

"Selection and scheduling of courses can directly influence efficiency in campus activity. Computer analysis of data from previous semesters concerning the size and location of classes, university and departmental course requirements and demand relationships among various courses will allow for a more orderly arrangement of student class schedules. This would affect a decrease in both the number of trips to campus and length of time spent on campus per week by the average commuting student. Indirect effects of efficient computer scheduling would be reduction in the daily peak accumulation of vehicles parked on campus and some alleviation of campus access and circulation problems."(329)

In terms of reducing peak arrival and departure loads on approach roads and transport services to the campus, the introduction of staggered hours has often been advocated but seldom implemented.(330) The only instance of implementation I found was at Bath, where Davies states that staggering has been implemented "on a small scale."(331) In terms of rationalising the accumulation of vehicles on the campus, my researches are not able to turn up any evidence of this ever having been attempted, which I think puts the efforts of Elliot into perspective, and clearly identifies him as a pioneer in this field.(332)

9.4.4 Transportation planning — need for, objectives of, policy guidance of, methods of, implementation of and resources devoted to.

i) Need for transportation planning.

Guyton and Reed make a plea for comprehensive integrated planning. "The lack of a logical, long-range campus traffic circulation and parking plan is . . . a serious problem. Although there has recently been an increasing awareness of the need for adequate planning, there is a need for improved effort at many institutions . . . Co-ordination of the traffic and parking plan with the general campus development plan is highly desirable. Co-ordination between the traffic facility and parking facility aspects of the campus plan is required to insure that satisfactory traffic access is provided from the urban area street system to the campus parking facilities where the driver then becomes a pedestrian. In addition, the portion of each person's trip between the office or classroom and the parking lot also requires attention in planning for campus circulation."(333)

ii) Nature of transportation planning.

Andrews points out that planning is a process, not an end state. "A development plan can no longer be seen as a blueprint, to be implemented piece by piece. It requires continuous

re-evaluation as time goes by and circumstances change. A general destination is a necessary guideline for planning. This changes the emphasis of physical planning from pretty drawings to that of establishing procedures, design criteria, and development strategies to satisfy University goals."(334)

iii) Policy guidance of transportation planning.

Policy guidance, write Quillen and Yu, should preferably be provided by a campus traffic committee representative of every group which forms "a substantial percentage of the campus population and is significantly affected and concerned by the transportation problems." "This committee can advise, as well as serve to link the head of the program . . . and the system user. Also, this committee can critique alternates, consider different courses of action and university policy and, following open review concerning all choices, advise the administration on the adoption of recommendations."(335)

iv) Resources devoted to transportation planning.

"The program, to be effective, requires a wide range of specialised talent. The work within the campus transportation division should be conceived as a team effort with several disciplines represented."(336)

v) Goals of transportation planning.

"One weakness in previous traffic planning procedures has been the failure to identify basic goals of the university and to develop the entire planning process around the attainment of these desired goals."(337)

An example follows of goal conflict. Myles Wright, in his inimitable style, highlights the conflict between convenience and environment in the following terms : "There have been periods within some universities when it has appeared that quite large numbers of leaders of youth are prepared to vote that tarmac should stretch from one end of the campus to the other, and from door to door, provided they can park their cars."(338)

vi) Transportation planning policy.

Fink quotes the University of Washington statements on transportation policy, formally set out and agreed upon by the top policy-making team in the University as such statements should be. The initial statement (there are nine all told) is worth quoting for its uncompromising attitude, ie. : "Transportation priorities from most to least desirable are : (a) walking, (b) bicycling, (c) bus, (d) car pool, (e) car with driver only, and (f) motorcycle."(339) Andrews sets out a similar set of priorities for within the St Paul campus.(340)

"Some of the principal considerations in developing a campus parking policy are :

- a) Trade-offs between such factors as safety, convenience, efficiency, economy, esthetics and campus space requirements for other uses.
- b) Determination of the varying parking requirements of different segments of the campus population and the development of assignment priorities based on these needs.
- c) Establishment of a rate structure that reflects the relationship of parking supply to demand.
- d) Establishment of a program for financing campus parking."(341)

A controversial policy issue is (b) above – on what basis should parking priority be accorded? The equity aspects of this issue have been introduced.(342) Should these aspects be resolvable, the question then remains : should the priority be accorded to status or to ability to pay? Whereas Pendakur and Sukumaran advocate the latter,(343) Reed replies that : "A system based solely on ability to pay would also be discriminatory and would probably be unacceptable to many campus users."(344) Cambridge and Carter both note that priority by status has the upper hand at the present time.(345)

- vii) Implementation of the transportation plan.

Guyton and Reed stress communication with the system user during the implementation, to gain his co-operation in respect of changes, and to obtain his opinion on priorities in the face of changing circumstances.(346) Evaluation of the plan should be made at regular and frequent intervals, permitting the planners to keep abreast of new development and to modify the plan.(347)

9.4.5 Alternative methods of allocating parking bays

This sub-section reports on opinions whether bays should be allocated to individuals or should be "pooled" in some way.

Maher and Birchall apply linear programming to the allocation system for permits at Leeds University parking precinct, and conclude that "the optimisation of both zoning and allocation systems could lead to a 35 to 40 percent reduction in the average generalised walking distance." However, very significantly, a substantial portion of this reduction could be obtained merely by using the "free-for-all" one-big-pool system.(348) The flaw is that no privilege is accorded to any category of drivers ; this extreme solution is therefore not generally acceptable.

Kleberg reports that a majority of universities in the USA make student parking assignments on a lot basis, as opposed to assigning an individual space.(349) Barr attacks the

privileged position of staff ; stating that "usually every member of the faculty and staff has a parking space earmarked by name on campus for his use." He condemns this as "improper use."(350)

Perhaps the answer for RSA use is to follow the pattern of the typical British compromise. For example, at Newcastle, permits to several separated pool areas are issued, for specific pools, to all staff plus sixty (that is all the spaces that remain) "students nominated by the President of the Union Society plus students who have obtained reserved parking spaces on the grounds of physical disability."(351) UMIST has evolved a delegated allocation policy in respect of the operation of its several separated pool areas ; no individual allocations are made.(352)

9.4.6 Innovative planning techniques or technological measures

These will be covered as briefly as possible.

- i) Vertical separation, in the central campus, of vehicle and pedestrian.

Bath University has a compact linear plan, using the slope to put a service road one floor below a pedestrian deck.(353)

- ii) Smaller cars, smaller parking bays.

"Quite a high proportion of cars, particularly those owned by students, may be small ones Thus if 25 percent of the total number of bays were small ones, an overall saving of 12,5 percent in total bay area would be possible."(354) Photo 25, with my tongue in my cheek.

- iii) Multi-level parking structures.

Many universities in the USA have multi-level parking structures. Users pay fees ranging from nominal amounts to a rate calculated to return full interest and redemption over the economic life of the structure.(355) Private enterprise involvement has been advocated and has in some cases taken place.(356)

The biggest campus parking structure I have seen is that at UMIST. This 900-space structure on four levels, on the boundary between the tight central city campus of UMIST and the CBD, was developed jointly by the City and the University, and half of the spaces are available to paying members of the general public. Whereas the latter paid (in 1975) 65 Pounds sterling per annum (or 25 p daily), UMIST staff (in any category), postgraduates, and final year students could purchase a magnetic card to operate the entry barrier for the price of

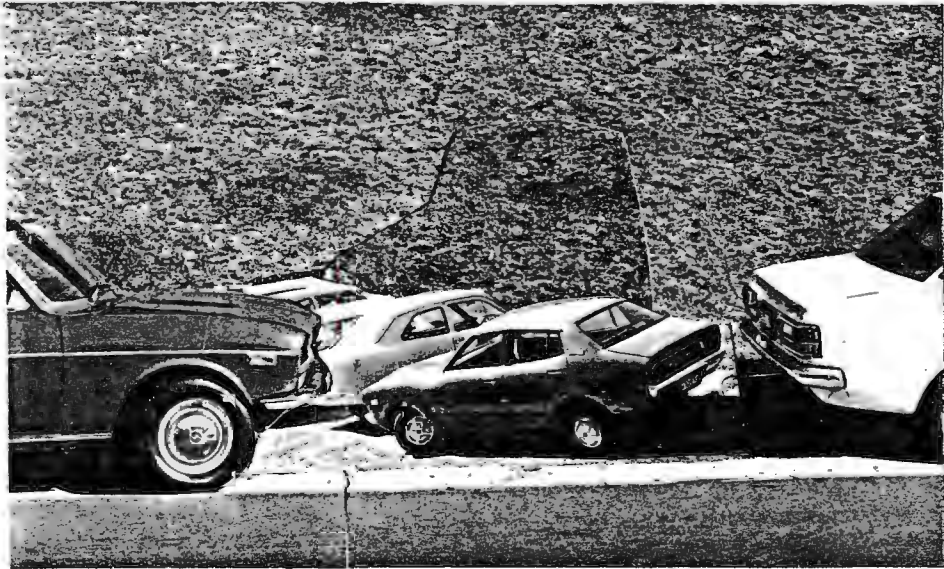


Photo 25 : "Small ones."

8 Pounds per annum or 11 p daily. There is no reservation of individual spaces.(357)

iv) Automatic control of parking areas.

Meters are widely used on USA campuses, principally "in congested areas of the campus where high turnover rates are desirable, and for short-term visitor parking where their familiarity makes them well accepted."(358)

"The automatic parking gate is the basis for other types of entrance and revenue control devices especially designed for lots and self-park garages. Access is gained through automatic ticket spitters, coins, tokens, cards, keys or vehicle identification detectors."(359) Magnetised entry cards are especially suited to control of vehicles entering reserved parking lots.(360)

v) Alternative parking allocation methods, using the computer.

The method of Maher and Birchall was mentioned in the preceding sub-section. Undoubtedly this could be refined to incorporate the extra variable of "privilege." Whitlock describes such a system, applied successfully to Carnegie-Mellon University. "On occasions when time-cost values can be placed on development costs and categories of users, a relative measure of the optimum utility of a given parking site can be determined. If given the variables of cost at the origin and destination ends of the trip (parking cost versus value of user's time), the linear program can quite readily and inexpensively correlate the pertinent factors to ascertain the optimum plan for off-street parking. The circumstances where model application is most efficiently achieved are where categories of users can be quantified by type and time value. The program will aid site planners to develop a parking plan that is most cost-effective."(361)

vi) Bus priority and control systems.

The best-known example is the demonstration project at Kent State University. It incorporates TRANSMAN (Transit Management Control and Information), which is a computerised system triggering action on and providing information on maintenance, passenger data, driver scheduling (tells him if he is running early or late), revenue and cost benefit analysis,(362) and a traffic signal system which gives priority to buses.(363)

vii) Remote car parks, served by shuttle bus.

These remote car parks could be university property, or they could be parking areas in nearby suburbs which are used by arrangement with the owner ; especially suitable are parking areas, such as those for sports stadia, cinemas or theatres, normally used in the evenings or on weekends ; the university use will then complement their use by their normal patrons. Buses

collect large numbers of passengers who have parked their cars at these lots, and then distribute them at off-loading points close to the centre of the campus. These measures eliminate a large percentage of campus-destined traffic and also reduce campus parking demand.

The best-documented system of this type is that operating at the University of Iowa(364). No fare is charged for the trip ; the combination of parking income (parking on the peripheral lots is free, but a charge is made for parking on the central campus) and a student levy support the system. In terms of parking relief, a survey undertaken before implementation of the system suggested that about 30 percent of the students who parked on campus would change to perimeter parking given a shuttle service;(365) in the second year of operation about 1 000 permits were issued for remote parking,(366) which is 12 percent of the student car drivership.

viii) Intra-campus transit service.

Doxiadis writes that he "cannot accept the campus which operates with a car connecting its parts."(367) But "when it becomes difficult to walk from one side of a campus to the other during the minimum time allowed between classes, other modes of travel, such as an intra-campus bus system, become desirable."(368) There are two reasons why this walk could become difficult.

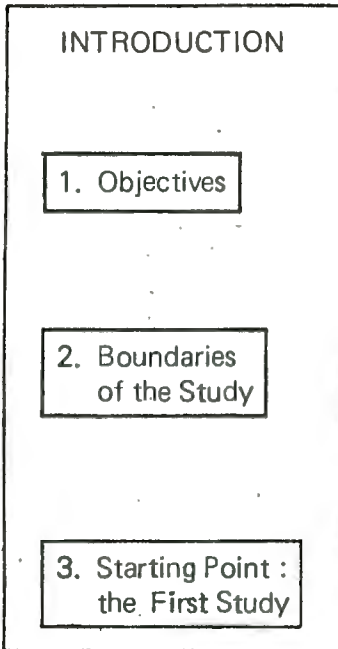
The first is the size of the campus (but USA campuses are often much larger (in land area and in student numbers) than RSA campuses, or Australian or Canadian for that matter). Solutions such as the use of the bicycle or car could be supplemented by bus services.

The second reason why it might not be possible to change classes in the usual ten-minute break could be that next classes are several miles away on another campus. Several USA universities have this problem of two or more campuses, and almost all of them have introduced bus services to link them.(369) Minnesota envisages three phases of transit to link its St Paul, East Bank and West Bank campuses. Buses presently run on public streets ; the next step is buses on an exclusive right-of-way, and the final step is automated vehicles on this same right-of-way.(370) Already at the stage of automated PRT (personal rapid transit) vehicles is West Virginia University, where the Urban Mass Transportation Administration demonstration project, connecting the two Morgantown campuses, two miles apart, came into operation in 1974. The design and initial construction stages of this project were excellently documented ;(371) its reported cost escalation and inter-authority disputes have been less in the news.(372) However teething problems would appear to have been overcome ; the system is now being expanded.(373)

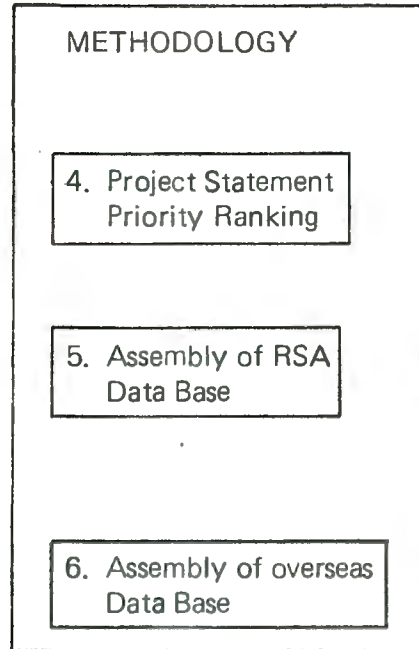
ix) Funding as a demonstration project.

Federal aid is, in the USA, available for university projects.(374) The Urban Mass Transportation Administration (UMTA), particularly, has funded several projects described above, including the Amherst collector bus, the Kent State bus priority system, and the Morgantown PRT. The UMTA's primary reason for funding these projects is that it, in its view, the campuses are "microcosms of many common urban transportation problems," and it wishes to test innovative solutions on a small scale in a relatively controlled environment.(375) The UMTA money usually pays for the initial capital outlay and for operation for one or two years or however long it requires to study the system ; the university then has the option of taking the system over or asking UMTA to remove it.

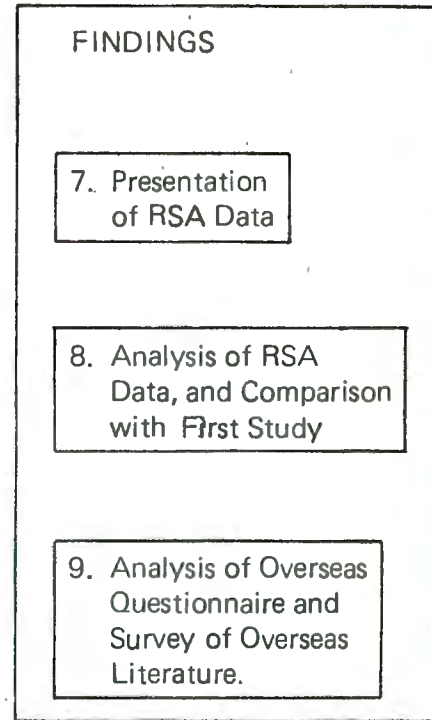
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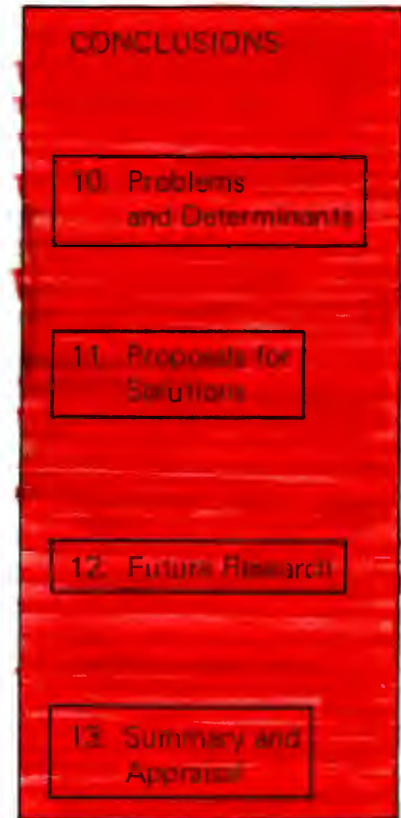
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III



IV



CHAPTER 10

PROBLEMS AND DETERMINANTS

10.1 PROBLEMS

The aspects of the "transportation problems" are legion ; however they could be categorised under :

- i) Problems of access to campus.
- ii) Problems of circulation within campus.
- iii) Problems of parking on the campus.(376)

No attempt will here be made to list these aspects – the reader is referred to the many examples quoted in the previous chapters. Some discussion of generalised causes is however necessary before proceeding, in Chapter 11, to a discussion of "solutions" to the problems.

10.2 DETERMINANTS OF PROBLEMS OF ACCESS TO CAMPUS

Central to any discussion of the problems of access to any campus, big or small, is the modal split issue. What determines modal choice?

Pendakur has listed six direct determinants of parking demand ; these were quoted in Sub-section 8.4.2 above. In the same sub-section I listed thirteen determinants of parking supply. In 9.2.2 I listed four broad principal reasons for "differences in parking characteristics and modal split." Fink (quoted in Sub-section 9.4.2) found five determinants of "travel orientation." In Chapters 8 and 9 above, many other reasons for modal choice or parking supply or demand are advanced. But parking supply and demand are variables which are dependent on modal split or "travel orientation"; at the same time they influence it (and each other) in their turn.

Hence the consolidated list, below, of twelve variables which determine the modal split of the journey to and journeys within the campus.(377)

- i) Population of the urban area in which the campus is located.
- ii) Location of the campus within the urban area.
- iii) Absolute size of campus population.

- iv) Mix of campus population, especially staff/student ratios, male/female ratios and undergraduate/postgraduate ratios.
- v) Age of campus.
- vi) Topography and climate of campus and environs.
- vii) Scale and intensity of environs development (especially in respect of availability of housing suitable for students, and of other facilities required by students).
- viii) University housing policy.
- ix) Lecture-timetable.
- x) Convenience, cost and availability of alternative modes. (This includes issues of car ownership, car occupancy, encouragement (or otherwise) of hitch-hiking, road links, bus services, rail services, bicycle routes and pedestrian routes. For the purposes of this listing, parking issues are excluded.)
- xi) Availability and convenience of parking on-campus. Availability and convenience of parking off-campus. Also the allocation policy, eg. individually assigned bays versus "pools."
- xii) The university policy on parking supply in respect of prohibition of parking or car ownership among particular categories of the campus population. Strongly influenced by enforcement of this prohibition, ie. policing of parking areas and sanctions against transgressors.
- xiii) Imposition of parking tariffs. Including a consideration of differential tariffs according to status of driver, or his ability to pay, and convenience and exclusivity of the parking space.

It is most important that the context of this list is carefully stated.

The above variables are not given in order of importance. They are not all of equal importance. Their order of importance varies from campus to campus.(378) What should be abundantly clear from Chapters 8 and 9 above is that not one of them dominates the determination of modal split at any campus — they all have an influence, be it small or large, but never dominant and never negligible.

This list is not an exhaustive one. Certainly however, all the major variables are included.

These variables interact, interrelate and overlap.

The manner in which they influence modal split should be apparent from the evidence of Chapters 8 and 9 above. Their varying degrees of relative influence, and of absolute influence, depending on the circumstances of each campus, should also be apparent. I do not propose to repeat or even summarise this evidence.

The above might be termed the "rational" determinants of modal choice. There are

also the "irrational" elements in a choice ; the effect of these elements is, on aggregate over a large population, negligible. Note that the oft-quoted preference, in the face of all dissuading influences, for the car, is not usually irrational. As Floor has pointed out, "bus and car transport are not interchangeable . . . person-kilometres of car travel may be far more productive than those of bus travel."(379) Hence any prejudice in favour of car transport is usually very soundly motivated.

At an indirect level (the division between "direct" and "indirect" is convenient but, to a certain extent, somewhat arbitrary), a series of factors (also interrelated with each other and with the "direct" factors) influence the university's policy reactions to the above modal choice determinants. The same general remarks apply to these as to the list of "direct" variables. The list of these indirect factors follows :

- i) Planning objectives.
- ii) Decision-making processes, including the aspect of student and staff participation.
- iii) Financial resources.
- iv) Historical reasons, whether they be of a physical nature (eg. existing buildings) or of a non-physical nature (eg. what the "planned" will accept in terms of control is very much conditioned by what they have been used to before).
- v) Attitude and actions of authorities outside the university, eg. traffic intrusion on King George V Avenue, and the response of Durban Corporation thereto.
- vi) Considerations of equity, especially the plight of "captive riders."
- vii) The level of available planning knowledge. The importance of this should not be underrated. To illustrate, due to faulty information or faulty interpretation of correct information, the university might, if it misunderstood either the problem in hand or the "solutions" to the problem, react so as to exacerbate its transportation problem.

10.3 DETERMINANTS OF PROBLEMS OF CIRCULATION WITHIN CAMPUS

"Internal circulation is concerned with all types of movement on campus proper. When pertaining to a multi-campus institution, it also includes the transportation flow between two or more university areas. The growth of universities has . . . (resulted in) an increase in the magnitude and concentration of the flow of travel between campus activities. Furthermore, the outward extensions of this development to the fringe areas of the campus has resulted in longer distances between many related areas. The combination of these factors has resulted in slower and more congested on-campus movement. At many institutions, the problem of congestion is further complicated by large volumes of non-university-oriented traffic conflicting with the already intense campus-oriented traffic. In addition, the presence of a number of different modes of travel on campus can in itself be a source of conflict."(380)

10.4 DETERMINANTS OF PROBLEMS OF PARKING ON CAMPUS

Closely mutually dependent are the modal split issue and the issue of the equalisation of parking demand and supply.

"The demand for parking is especially sensitive to university administrative decisions concerning housing, class scheduling and enrollment policies. By controlling these factors, the university administration can effectively influence the future demand for on-campus parking and more effectively plan the location and distribution aspect of future expansion."(381)

At what level of parking supply should a balance between parking demand and supply be sought? The most appropriate point of balance would need to be assessed for each campus, bearing in mind its unique circumstances, at regular intervals (at least annually). Its determination would depend on trade-offs between factors (the list is not exhaustive) such as :

- i) Availability and convenience of alternative modes to the car.
- ii) Safety and environment on the campus.
- iii) Campus land requirements for other uses.
- iv) Redistributive effects between component groups of the campus population who would be unequally affected by any measures to ensure a balance.
- v) Development of a programme for financing campus parking.

The "indirect" factors of Section 10.2 above would play a major role in determining the point of balance.

In the medium term,(382) demand for parking can be made to equal supply, whether this be demand equalling present supply, or demand equalling supply at some future point in time. Confining the discussion, for the simple reason that the reverse situation is not a "problem", to the normal situation that demand is tending to exceed supply, when should demand be decreased? This would be necessary if supply was being decreased, or if the natural increase in demand is making it outstrip the rate at which supply can be increased.

Reference to Fig. 7 might assist understanding of the structure of the discussion which follows.

Viewing from the supply angle, supply may most likely be increased by constructing more parking spaces or by negotiating for the use of more off-campus parking areas. Supply may most likely be decreased by the loss of campus parking areas to new buildings (the usual reason)(383) or by the municipal authority imposing parking restrictions on streets, near the campus, favoured until now by students and staff for kerbside parking.

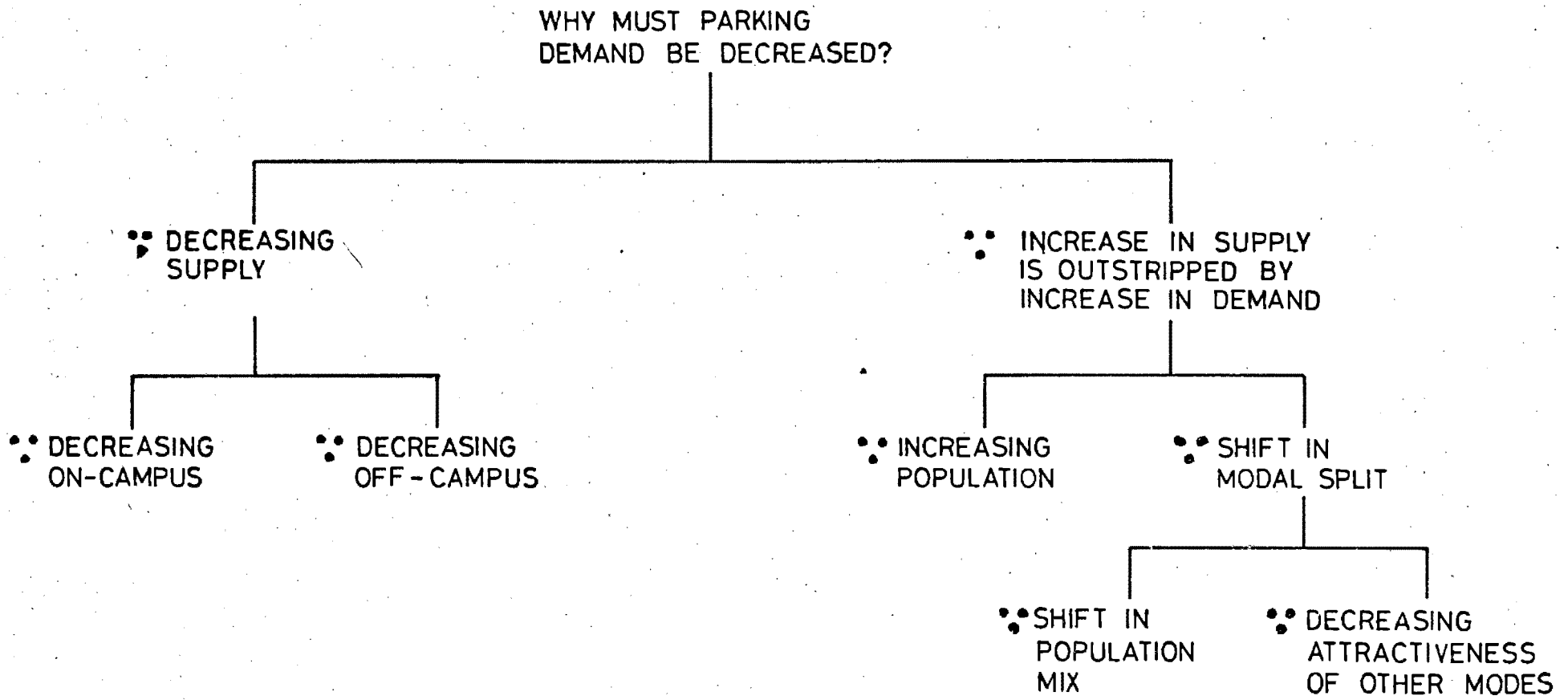


FIG.7 WHY PARKING DEMAND MUST BE DECREASED.

Why would demand increase? The two reasons, usually mutually supportive, would be an absolute increase in campus population and/or a shift in modal split to car drivers. This latter could in turn be due to :

- i) A shift in population mix, with a relative increase in a component group which drives cars more (eg. the generally apparent tendency towards increasing proportion of postgraduate students.)
- ii) The decreasing attractiveness of other modes, which is in its turn due to a variety of reasons ; all the significant reasons were listed in Section 10.2 above. It is appropriate at this point to stress once again that the decreasing attractiveness of modes other than the car, in any particular circumstances, is a complex function of many reasons, not least among them the increasing attractiveness in absolute as well as relative terms of the car.

How then can demand be decreased? In the very long term (decades), campus relocation or change in the university's environs, and in the long term the construction of nearby university housing, could all decrease demand. In the medium term, a programme of transportation management to reduce parking demand could include the following in combination :

- i) "Carrot" measures, to attract the car drivers to the use of other modes.
- ii) "Stick" measures, to push the car drivers to the use of other modes.
- iii) Manipulation of lecture timetables in order to reduce peak loads.

These will be considered in more detail in the next chapter.

CHAPTER 11

PROPOSALS FOR SOLUTIONS

11.1 CAUTION ON GENERALISED SOLUTIONS

Perhaps the word "solutions" should always be printed within inverted commas. The reader will surely forgive my cynicism, but I have too often read in my literature survey of so-called solutions being applied to or proposed for circumstances in which they will not be successful, and might in fact work contrary to the intention of their advocates. Particularly, I have read of proposals in which the solutions were misapplied, because of faulty understanding of the way in which they should be used, or because they were inappropriate anyway, irrespective of the method of application.

To explain further :

- i) **The unique character and circumstances of each campus must be appreciated before any solution derived from "average campus" circumstances is contemplated.**

Particularly, the present workings of the campus must be understood in respect of each unique combination of factors determining the existing modal split.

With all the zeal of a convert, I am especially wary of generalised solutions expressed in mathematical terms.(384) I grant that the "data averages . . . provide guidance for both policy and technical decisions in traffic and parking circumstances." I agree that "perhaps their greatest values are for comparative purposes and as a guide in preparing forecasts for a growing institution."(385) But my finding is that their danger lies in their too ready acceptance by university authorities without sufficient investigation of their background and without sufficient comparison with the circumstances of the campus to which they are being applied.(386, 387)

- ii) **The solutions are often expressed in terms which are too simplistic, and fail to take account of important variables. If suspect, such solutions should be discounted.(388)**

For example, as Pearman and Button have commented, "models . . . must include, among other things, some indication of relative costs — not just monetary costs, but a more generalised cost measure to include travellers' evaluation of journey time, service characteristics etc. To overlook these features can be misleading."(389)

- iii) Finally, not for the last time in this thesis, I stress **the need for a carefully integrated package of solutions to be applied to the transportation problems of any campus ; manipulation of only one or two variables will certainly not be successful, and might even produce unexpected and undesired results.**(390)

I have underlined the principal passages because of their critical importance to the message of this chapter.

Having made my point about generalised solutions inappropriately applied, I acknowledge that there are many circumstances where generalised solutions could be appropriate. For instance, to quote Pendakur : "While each university has its own particular character, many of the problems posed by the automobile are monotonously repetitive and vary only slightly from campus to campus."(391) The trick that the planner must learn is when to use his discretion.

11.2 EVALUATION OF SOLUTIONS

Shands have stressed, in an excellent overview of the topic, that : "In many ways the evaluation phase of the study is the most important but unfortunately in the past it has often been neglected with the result that decisions are made on value judgements which by their very nature incorporate a large element of bias."(392)

I recommend to the reader the standard text on evaluation of transport plan (solution) alternatives, by Thomas and Schofer.(393) At the same time I draw to his attention the need to give explicit recognition to the five areas of concern set out below.

- i) Need for evaluation in the light of possibly conflicting objective sets.

Shands list three different viewpoints, ie. the system operator, the system user, and the non-user.(394)

Here I wish to draw attention to a particular aspect : "A common feature of many (evaluation) studies has been the implied assumption that, if the total benefits exceed the total costs, the project is desirable from public policy standpoint. This aggregative approach is oblivious to the redistributive effects of public decisions."(395) Or, as Rees put it in an example of South African importance, "consideration of **who** benefits may be far more important than the overall magnitude of the benefits."(396) The interests of minority groups such as transit "captive riders", non-White staff and students, and the physically handicapped must not be forgotten.

- ii) Evaluation at abstract scale without recognition of possibly inevitable conflict on experiential scale.

The root of this conflict "is to be found in the divergence of system (unitary) and project (disaggregated) perspectives." (397) Everyone may agree that a pedestrianised campus is "a good thing", only to resist the proposals when abstract lines on a map become tangible threats to treasured parking privileges. Conversely, a pedestrianisation proposal might be resisted from the (perhaps unfounded) fear that this poses a threat to one's own parking privileges.

- iii) Evaluation in the light of different values given to tangible consequences.

This is best explained by reference to the examples of the greater productivity of car travel and greater perceived cost of bus travel, quoted from Floor and Pearman and Button above. (398)

- iv) Omission of one or other of Shands' four not necessarily mutually exclusive phases of the evaluation process, viz operational, economic, environmental and financial.

A very important phase in the present economic circumstances is the financial. Whereas the economic evaluation might show by means of a cost-benefit study that "best results" would be achieved from a capital-intensive scheme (for example, a multi-storey parking garage on-campus), it could be that the capital required is not available. So a "lesser result" would have to be accepted in the interests of financial realities.

- v) Integration with the overall planning of the campus.

Last, but not least, is the sine qua non that the transportation planning match with the overall plan. (Just as essential, the two plans should have been drawn up, right from the stage of setting of objectives, with the closest possible co-ordination). "The goals of campus transportation must be compatible with and actually part of the overall university goals as well as of total regional and community transportation planning." (399) See Fig. 1.

To quote Shands again : "Often the decisions that have to be made are based on information whose accuracy is uncertain and which is not quantifiable, thus increasing the chances of incorrect or less than optimal decisions. This is especially true in the case of transportation plans. The decision-maker needs an evaluation method which will reduce the possibility of making wrong decisions and which will help him to better explain the reasons for this final choice." (400) Such techniques are available. (401)

11.3 THE SOLUTIONS

11.3.1 General

Before reading this section, please re-read Section 10.1, which stresses the many aspects of the "transportation problems", as many of the solutions which follow have application to some aspects but not to others. Even more important, please re-read Section 11.1. "Caution on generalised solutions."

My attention is confined to medium-term(402) and long-term(403) solutions. I have not considered very-long-term solutions such as campus relocation, although this might be a possible solution (and a solution very much used too – nearly every RSA university has moved campus at least once this century, though I must admit that several of the original campuses, eg. UPE, UDW and RAU, were never intended to be anything but temporary). Nor have I considered the solution "alter the scale and intensity of environs," another very-long-term task, if it is worth attempting at all. A third solution of the same type, viz "acquire large amounts of land adjacent or near to the present campus," while obviously valid, is hardly the sort of weapon available to university authorities, except at tremendous expense, unless they are fortunate to be able to expand into areas due for urban renewal or into greenfield sites. Which is perhaps an argument for locating new campuses adjacent to areas which, in the planner's opinion, will be ready for redevelopment (or, in the greenfield case, initial development) when needed by the university. This solution, too, has been extensively used in RSA (particularly by UStell and UPret).

Topography and climate, too, come with the site and cannot be "solved." However, note will be taken of measures whereby the topography is "overcome."(404)

Not to be considered further is the "solution" "restrict campus population growth," as my self-imposed (but thus far unstated) brief for this thesis was to investigate only growth situations. I accept population mix as a given, although it is potentially subject to influence by the university authorities, as it also falls outside my brief.

The conclusions which follow in the remainder of this chapter are based on the evidence of the research reported in the preceding chapters.(405) Some issues have been held back for attention in Chapter 12, as further research is needed on them.

Solutions to problems of access to the campus and of parking on the campus will be considered separately from solutions to problems of circulation within the campus. While they have many common points, it is convenient to separate them because of basic character differences.

11.3.2 Solutions to problems of access to the campus and of parking on the campus

i) An increase in on-campus university housing will reduce the traffic arriving at the campus every day, and also has obvious economies in terms of saving of commuting time. Against this, an increased residential component has the obvious implication that any cars will require permanent parking spaces on-campus instead of for just the lecture activity hours. On the other hand again, the convenience of being on-campus leads to voluntary reduction in car ownership and does make it easier for restrictions on car ownership to be imposed by the university authorities.

The same advantages, without the disadvantage, would seem to be applicable to student and staff housing within easy walking time of "the most popular destinations." Estimates of the critical "easy walking time" vary from four minutes(406) to twenty.(407) Even if persons living close to the campus possess a car, they are unlikely to use it for the journey to campus. While it is a debatable point if it is more efficient to use subsidies to relocate students close to the campus than to subsidise public transport,(408) there is lots of supporting evidence for the transportation advantages, on balance, of the university —

- constructing new housing within the campus, and
- buying up land for redevelopment, or suitable off-campus housing, close to the campus.(409)

ii) A redistribution of parking areas (with or without an increase in supply) in order to bring about a closer relationship of parking areas to destination on the campus,(410) together with a rationalization of the road layout (this may or may not involve new construction), will in some cases achieve economies in vehicle and commuter pedestrian travel on the campus.

iii) The reconstruction of congested arterial roads giving access to the campus and of congested vehicle entry and exit from the campus are measures on which no generalised comment can be made that would not sound trite in the sense that while they are obvious to the university authorities, these authorities do not have the power to implement them. The particular circumstances of each campus must be the subject of discussion with the local authority, especially if heavy capital expenditure is contemplated.(411)

iv) Carter has expressed so well the advantages of a manipulation of the lecture timetable.(412) To expand upon his remarks, there are two aspects of the "transportation problem" to the improvement of which lecture rescheduling could make a substantial contribution, using computer techniques presently available. A rescheduling to improve the one aspect need not in any way conflict with rescheduling to improve the other aspect. The aspects referred to are :

- a) The congestion of approaches and entry/exit points at peak time. This could be reduced by a staggered arrangement of starting times of lectures. (Analogous to the suggested staggered working hours in the CBD.(413)) Savings would also be obtained in the public transport capacity which has to be provided.
- b) The uneven loading on buildings and parking facilities through the day, with higher demand in the morning. A lecture timetable which balanced morning and afternoon (and evening?) activity, taking into account the needs of every student so that a reduction in both the number of trips to campus and the length of time spent on campus each week is obtained, would release substantial building and parking space at the peak demand time.
- v) Measures to increase the attractiveness of alternative modes would go far to reduce the present dependence, at most universities, on car drivers who bring with them problems of congestion, pollution and intrusion, and storage (parking).

At the heart of the matter is the contention, which I am satisfied is true, that alternative modes will not voluntarily be used unless they provide a level of service which in terms of travel time, convenience, comfort and cost exceeds that of the car. (This is the "carrot" half of the "carrot and stick" analogy.) May I stress that the "cost" that influences the driver is his perceived private cost and does not take into account any social cost which his choice imposes on the campus ; the greater productivity of car travel weighs heavily in his perception of cost.

The principal alternative modes are :

- a) Increasing the number of car passengers.

"The average automobile holds from three to five passengers plus the driver, yet commonly only carries 1,2 to 1,7 persons. The use of car pools is inconvenient to many and also places limits upon versatility."(414) Yet car pools and, despite its dangers under certain circumstances, hitchhiking are obvious substantial contributors to efficiency and convenience. Measures to bring potential passengers together with car drivers on a regular basis could be arranged through a university-sponsored information bureau.(415) Measures to improve the safety and comfort of hitchhikers, at least on the homeward journey, could include formal hitchhiking areas with shelters to provide some protection against the weather.

- b) Bus services.

"Many question why mass transit is not used more. Where service is provided, the prime reasons are —

- it is inconvenient (scheduling and operation);

- it lacks versatility (loading points are often too few or are inconveniently placed);
- it is expensive (often, the rates are out of proportion to the service rendered) ; and
- it is time-consuming (buses are slow when forced to compete with more manoeuvrable cars in high volume traffic ; some origin-destination pairs require one or more changes of carrier."(416)

Clearly, therefore, any proposed bus service must, in order to have any chance whatsoever in voluntarily attracting commuters from cars, remove the justification for each of the above criticisms, as follows (in the same sequence) —

- increase frequency and coverage ;
- improve location of loading and off-loading points, especially on the campus, where the bus should be able to penetrate to a point closer and more convenient to the major activity areas than the car is allowed to ;
- make the service free ; and
- improve the directness of the bus service, and give it preference by means of bus priority at intersections and exclusive busways on heavily trafficked routes.

Other considerations include —

- at loading points, shelters should be built to provide some protection against the weather ;
- information on bus routes and frequency, to really "sell" the service to the students and staff, must be readily available at stops and elsewhere on the campus ; there must be a substantial marketing campaign, or people will not know of or appreciate possible advantages of the service ;
- the closest possible co-operation with the bus operator must be maintained ; and
- the plight of captive riders, especially handicapped persons and lower-paid Non-White staff, should be sympathetically assessed.

How to fund all of this, if fares are not paid? I suggest two principal sources of funds, viz —

- an annual levy on all students and staff irrespective of whether they use the service or not ; in this way, the perceived marginal cash payment for each journey by bus is zero, because the payment is made whether the journey is undertaken or not ; and
- a subsidy from the university authorities equivalent, in per person terms, to the hidden subsidy paid to each person using a parking place for which he is not paying the full economic cost.

Two considerations set a practical limit to the extent to which the above philosophy may be applied, viz –

- there is a “point of decreasing return” (difficult to assess, because many intangible costs are involved) beyond which a bus service would not be increased in frequency and coverage ; and
- the university authorities may wish to continue, for very sound reasons to do with staff relations, perhaps as a hidden salary contribution, to subsidise staff parking to a greater or lesser extent.

“Mass transit is . . . able to move large numbers of people. If developed to its full potential, it could provide highly credible and satisfactory results, thereby contributing toward the solution of access and parking problems.”(417)

To close on a cautionary note : there is overwhelming evidence to show that good alternative modes to the car are a **precondition** of their patronage ; the other (“stick”) half of the story shows that there is however no guarantee of their use.(418)

c) Cycle routes to campus.

Provided the topography is favourable, and distances to place of residence are not more than a couple of kilometres, it seems likely that the construction of safe and attractive cycleways from the main concentrations of housing to the campus would encourage a worthwhile degree of use.

d) Pedestrian routes to campus.

It is doubtful if much can be done to encourage pedestrian movement to the campus beyond its present level. The only suggestions which are offered are, on heavily-used routes, to improve pedestrian safety and priority at intersections (though hopefully this has already been improved to its maximum) or to improve standards of surfacing, weatherproofing, lighting and policing.

vi) Achieve a reasonable balance between parking supply and demand.

This is strictly speaking not a “solution” of any problem, but is an important consideration in determining the degree to which the various solutions of the chosen package of solutions should be applied.

Following on from Section 10.4 above, the question is how to determine for each campus, bearing in mind its unique circumstances, the most appropriate point of balance at any point in time. I would not use, except for comparative purposes, any of the figures recom-

mended elsewhere and reported in this thesis. Each university must decide for itself where its balance lies, using its knowledge of --

- its own past experience ;
- its own present circumstances ; and
- its own objectives for the future.

Control of parking supply has the potential to alter many other transportation characteristics of a campus, principally modal split.(419).

Without at this stage going into the means whereby this balance between supply and demand may be achieved, one cautionary note must be sounded.(420) Suppose a campus has, at a particular point in time, achieved a balance between supply and demand, the latter being held down by, among other factors, substantial amounts of "congestion" (principally shortage of parking space.) A parking tariff is now imposed, or an improved bus service attracts some car drivers. It should not be thought that parking demand will fall by a number equivalent to the drivers who have ceased bringing cars to the campus, as the lessening of congestion will induce some "latent demand" drivers, previously deterred by the level of congestion, to change modes to cars. Conversely, an increase in latent demand without any increase in supply will not necessarily result in an equivalent increase in congestion, as the restraint of congestion will hold down realised demand.(421)

vii) Rationalise allocation of parking spaces.

One solution often advocated is the abolition of individually reserved bays. On the one hand, there are the economies of a single "pool" versus the inconvenience incurred by individuals who certainly rate more consideration. On the other hand, individual bays are obviously more inefficient, unless they can somehow be put to use during the temporary absences of the permit-holders.

I would be reluctant to state in general terms whether individual bays are better than "pools" ; so much depends on the value of the time of each person concerned and on the frequency and regularity of his arrivals at and departures from campus. Clearly, there will always be a case for some senior staff to have individual numbered bays. The reader may make his own choice between the computer-based "cost-effective parking plan" approach of Whitlock,(422) or the more rule of thumb, but probably nearly as efficient and certainly more participatory approach of UMIST.(423)

The question of "who" gets preferential parking spaces is discussed in (x) below.

viii) Make better use of all potential parking land.

I refer here to --

- remote areas of the campus, or nearby sub-campuses, on which surface parking could be constructed ;
- parcels of land close to the campus, on which surface parking could be constructed ; and
- existing close-to-campus parking areas, not owned by the university, but which could be used by arrangement with the owner.

The suggestion here, following USA practice,(424) is that these parking areas could be free (as distinct from tariff areas close to the campus) and served by a free frequent shuttle bus. They could be allocated to "low priority parking"(425) and, despite the inconvenience of the break of mode, my own feeling is that, given favourable circumstances (suitable land and sufficient disincentive to seek parking closer to the campus) parking areas of this type could make a substantial contribution. An incidental consideration is that the shuttle bus drivers could be students earning extra money, as is done in USA.

- ix) Allow parking congestion (ie. parking shortage) to reduce parking demand.

Congestion is a legitimate weapon for university authorities to employ in their armoury, but its effectiveness is restricted to situations where parking demand, including latent demand, is just in excess of supply. Its quantitative effect is difficult to measure unless the level of latent demand is known. Nevertheless it is made use of on all the pre-1960 RSA campuses, and will no doubt continue to be used to an increasing extent.

- x) Imposing restriction by edict in order to reduce parking demand.

Increasingly stringent controls on the issue of parking permits are being forced on most campuses, and are proving an effective means to reduce parking demand.

The question which faces the universities is — how to assess who not to leave out in the cold? Three major possibilities were revealed by the literature survey ; of these, the first is the most common and the last the least common :

- a) By status, usually in the order of descending preference : senior academics, senior administrative staff, postgraduates and then students down to first year. Handicapped persons usually enjoy special privilege.
- b) By residential area. Those living outside the city enjoy preference, then in order of descending preference come those living in the more remote areas of the city, those living close to the campus or "students who have a convenient bus connection to the campus,"(426) and finally those living on-campus.
- c) By ability to pay.

These possibilities are not mutually exclusive, and are often used in combination.

It would seem that most frequently used is "a priority system based on relative need." (427) On the question of preference in parking location, too, "parking for faculty and staff usually receives priority consideration based on the relatively high value placed on their time, and space is usually made available for them closest to the campus core. Commuting students should be favoured over resident students in the allocation of parking because of their relative dependence on the car as their means of campus access." (428)

Necessity is clearly preferred to equity. I agree, provided that the "necessity" criteria are flexible enough not to cause hardship for cases deserving of special consideration. However, persons receiving preference must pay the full market value of the bays they are allocated (unless, as mentioned in (v) above, the university authorities wish to subsidise particular bays). If these persons do not want to pay the tariff demanded, then the "value placed on their time" has obviously been over-estimated, and they can move to a lower-cost bay.

xi) Imposing restriction by pricing in order to reduce parking demand.

I have made mention above of parking receiving a hidden subsidy. But, "if a service is provided substantially below its market value, it will usually be used more than were the price based on supply and demand. With relatively inexpensive parking, there would be less incentive for students and faculty to adopt housing patterns which take advantage of available transit service, or to establish a pedestrian or bicycle relationship to campus. Thus, parking fees may be used not only as a source of revenue but also as a helpful tool in distributing a limited parking supply and in sharing campus land uses." (429)

There is growing support for the concept that users of parking pay the full cost or market value (the latter is preferred) of the bay they occupy. (430) Differential tariffs would be established, based on a demand analysis, according to the status of the driver, his ability to pay, and the convenience and exclusivity of the parking space. "Parking lots located in the outlying fringe areas of campus should command a lower fee and be more suited for the student population that can least afford a higher rate but is willing to walk a little farther." (431)

This concept is a very important departure from the standard RSA ways of thinking. Its introduction on any campus must be piecemeal over several years, and would need to enjoy careful presentation as part of a package including a major improvement in the provision of alternative modes in order to have any chance of acceptance. An assessment of price elasticity of demand for parking would be an essential preliminary to any decision in this regard, since there

is no advantage in raising charges beyond the point that parking demand is driven below supply.

xii) The use of improved control modes.

This follows from (xi) above. Carter recommends that, whereas the issuance of permits on a yearly basis is the norm because it is the cheapest way to administer parking, a parking pricing policy is most effective "when the user accrues some direct cost each time he uses the facility." (432) For this and for other control reason, there is much to commend the introduction of ticket spitters or other machines controlling entry to parking areas. Parking meters would be most suitable for small areas with high turnover, especially visitor parking, or kerb-side spaces. These devices would to a large extent supersede the present permit system — the machines could be manufactured to operate either on coins or on a vehicle identification mode, depending on the university policy of parking allocation by ability to pay or by necessity. While these devices are suitable for large parking areas, their use in small areas and on the kerb-side is expensive and visually and physically intrusive, and I can therefore only recommend their consideration for the control of large parking areas.

xiii) Improve enforcement.

A high level of enforcement is essential to any campus transportation policy. Fines and penalties should be strong enough to discourage violations ; measures such as a wheel clamp and towing are required, as it seems that far too few offenders are brought to book. The withholding of examination results is a simple and effective final sanction. "Efforts should be directed uniformly throughout all parking areas on campus and there should be no differentiation in the enforcement of student, faculty or staff parking violations." (433)

xiv) Improve the standard of transportation planning (or introduce it if it does not already exist!)

This is not strictly a solution, but is an essential contributor to effective solution of "transportation problems." The planning must be —

- integrated with overall campus planning ;
- interdisciplinary ;
- continuous, adaptive and flexible ;(434) and
- aware of all interest groups.

One way to achieve the last point is to involve the representative bodies in the planning process. Better still, involve them in the decision-making (as is often done in RSA) and in the decision-implementation. For example, the Staff Association should be given the option of allocating to individuals and/or groups the "staff" share of parking, and the SRC should allocate the "student" share.

Transportation planning recommendations must be put to University Council by a person or body with real status, or they will not be heard.

Several solutions are not considered here, because further research is needed on them, more than on those presented. They will be discussed in the next chapter.

11.3.3 Solutions to problems of circulation within campus.

- i) Mechanised people-movers (eg. escalators) to overcome the topographical difficulties.

Self-evident.

- ii) Regroup teaching facilities, ie. concentrate the complementary.

A pedestrian desire line diagram is useful to determine an "orderly location of nodes."(435)

- iii) Remove or neutralise traffic intrusion.

This solution depends on the co-operation of the municipality. The restriction of through-traffic on public streets without providing an alternative route may eliminate a problem on the campus at the expense of creating a greater one for the community.

- iv) Improve pedestrian facilities.(436)

This can be achieved by –

- closing streets ;
- grade-separating pedestrian and vehicle ;
- giving preference to pedestrian over vehicles at points of conflict.
- weatherproofing pedestrian routes, and improving surfacing, lighting and policing.

- v) Improve bicycle facilities.(437)

This can be achieved by –

- demarcating bicycle routes, and surfacing and lighting them
- giving preference to bicycle over vehicles at points of conflict, and
- providing safe storage facilities at buildings.

- vi) Provide bus service.

This solution is only of value if the university has several campuses. Perhaps its function would be performed by the shuttle bus described in the preceding sub-section.

vii) Provide rapid transit.

Only applicable to movement between separated portions of a multi-campus university, but not in RSA, because the use of expensive high-technology systems could never be justified.(438)

Now re-read Section 11.1 **again!**

11.4 SOLUTIONS : RSA PERFORMANCE

How much do RSA campuses appreciate these solutions? Are they intending to use them? Some selected comments follow in respect of UCT only.(439)

UCT certainly appreciates the use of student housing as a planning tool. "If the housing is suitably located within easy walking distance of the academic, community and public transportation facilities, then the car ownership of students could be prohibited, restricted or not permitted on the Upper Campus."(440)

UCT is the pioneer in the theoretical study of the use of the lecture timetable as a tool to reduce the load on transportation and other facilities.(441) "The timetable structure is one of the most important single elements for change in a university's pattern of activities and the space these activities generate."(442) These sentiments were enthusiastically taken up by Shands.(443)

Shands have presented a comprehensive recommendation to improve the "free" bus service, already superior in coverage and frequency to any in RSA.(444) This bus service, with its 1978 extension to Rondebosch Common, incorporates elements of the "shuttle bus to remote parking areas" concept.

"Not only does parking capacity act as a control of the number of vehicles arriving at the accesses and moving on the internal road system but also it is the one area where the University has the power of direct control over implementation." With those words, Shands then present a "balanced parking plan" which ". . . will involve some restraint but which can be managed without an inordinate amount of enforcement effort."(445) Parking restriction by congestion is recommended,(446) and by edict and price.(447) This together with the provision of alternative modes, produces a projected change in modal split.(448)

While on the subject of restriction by edict : Hampton attempted to quantify, by means of a points system, the **need** for any student to bring a car to campus. Points were to be awarded to status, to area of residence (for distance and for inadequacy of service by public transport) and to other factors such as physical handicap. This system was considered complex

but acceptable by Council, but foundered on opposition from the SRC, who were not prepared at that time (1973) to allow "elitist" differentiation between one student and another.(449)

The Staff Association at UCT have accepted the principle of restriction by pricing, but it is not certain whether they are prepared to go as far as market value pricing.(450)

Shands have stressed the need for strong enforcement of the traffic regulations. They reveal that "a major area of concern is the high proportion (22 percent) of persons who have no parking discs but who in fact park on the Upper Campus during the peak hour." Non-disc holders should be trapped at entry to the campus and refused entry.(451)

Proposals for the improvement of pedestrian circulation within the campus (the topography is against bicycles and the campus is too small to contemplate buses) are presented by Shands. These include the closing of University Avenue to vehicle traffic.(452)

UCT has an active long-established Planning Unit, able to call upon the assistance of a traffic consultant. It shows!

CHAPTER 12

FUTURE RESEARCH

"Future research should include the components of parking policy formulation, attitudes to public transport, and transport systems integration. Transport policies of the university and the city must be studied as they affect university parking demands. Further areas of investigation should include effects of climate on parking demand, modal split in relation to students and faculty, student housing clusters, and factors affecting car occupancy ratios. Documentation and research into parking controls and administration will aid greatly in policy formulation. Long-range rational land-use planning on campuses will ultimately be the key to an understanding of access, parking, and cost criteria for urban universities. The university's parking demand should be studied within the context of socio-economic determinants of housing and modal choice in relation to housing quality and quantity and its distribution within the urban spatial structure."(453)

I endorse the above list, by Pendakur, with the proviso that it is research in the RSA context that is required. (This research must of course take account of the cautions of Section 11.1.)

To Pendakur's list I append the following four areas of particular concern, viz :

- i) Research into the degree of latent demand for parking at various levels of parking congestion on campuses.
- ii) Research into elasticity of demand for parking.
- iii) Research into the economics of multi-level parking garages or parking beneath buildings.

In order to preserve costly (purchase cost or opportunity cost) land for other uses, several campuses in RSA have turned or are thinking of turning(454) to the use of multi-level parking garages and/or car parking floors in new buildings. The merits of this are debated in Carter,(455) and the conclusion is reached that, above certain land values, the parking structure becomes an economic necessity in order to "protect present investment"(456) in physical facilities of all types on the campus. An up-to-date graph, reflecting RSA costs, of the Wilbur Smith type(457) is required, correlating land cost and various levels of structure vs deck vs open parking lot costs, in order to discover at what land cost each type of parking structure

becomes economically justifiable.(458) (If it is financially feasible, is another matter.)

- iv) Research into financing of expenditure, especially capital expenditure, on university transportation facilities.

Direct central government grants and private grants for capital works, or State subsidies intended to contribute to normal running costs of the universities,(459) are not usually available for substantial expenditure on transportation. Guyton and Reed summarise the available sources of finance as follows :

- "a) The use of revenue bond financing, amortized by direct user fees, to construct traffic and parking facilities.
- b) A flat registration (parking) fee to be imposed on faculty, staff and student vehicles.
- c) A varying (direct user) fee dependent on the convenience of the parking space provided.
- d) A parking surcharge applied to the price of admission to . . . conferences and special events on the campus . . .
- e) Direct use of disciplinary traffic and parking fines and charges for new facilities."(460)

The merits of the above, and also three aspects or extensions of the above, need further research.

The three aspects or extensions are :

- a) The notion of using the campus as a laboratory for the demonstration (trial) of solutions to CBD transportation problems ; these trials to be funded by the central government's transport research authority, UMTA-style.(461) This would only be possible in a few carefully-selected instances, where the chances of learning valuable data on innovative urban transportation solutions were most favourable from the point of view of the funding authority, but these could represent a substantial contribution to university spending on transportation improvements, especially those of a capital nature. Many campuses generate as much traffic as a fair-sized town, and are able to control significant variables determining transportation characteristics. For example, the university has, on relatively isolated (few entrances) and concentrated territory, the power to —
 - restrict the use of cars by certain sections of the population ;
 - heavily subsidize public transport ; and
 - manipulate "office hours" (lecture timetable).(462)
- b) The notion of attracting private enterprise involvement in the provision of transportation facilities, most likely parking, perhaps on a concession basis.(463) Alternatively

or additionally, the notion of planning transportation facilities (again, mostly likely parking) in such a way that general public users will help pay for it at a higher tariff than university users.(464)

- c) The problem of whether **all** parkers should help pay the costs of new facilities, or whether the marginal costs of these new facilities should be passed on to the users of the facilities only. (This often arises overseas from a decision having to be taken whether part of the payback for new parking structures should be spread over all ground-level parking.) (465)

A final remark. Keefer and Witheford recognise the essential similarities between transportation problems in various institutions.(466) Some attempt should be made to correlate the information available from suitable studies in RSA(467) and overseas,(468) to their mutual advantage.

CHAPTER 13

SUMMARY AND APPRAISAL

13.1 INTRODUCTION

In this final chapter, I will very briefly summarise my findings, and at the same time attempt to measure the performance of the thesis against the priorities of Chapter 4 and the objectives of Chapter 1.

13.2 SUMMARY, AND APPRAISAL AGAINST PRIORITIES

Taking the project statements of Chapter 4 in the order of priority accorded to them by respondents (they are all of course expressed in terms of RSA campus needs) :

- i) Prepare warrants for restricting car use by "stick" methods such as edict, pricing and congestion, as opposed to restriction by carrot methods, eg. convenient and cheap alternative modes. Comment on acceptance by students and staff.

It is found that the preparation of generalised warrants is not to be recommended. Instead, a wealth of comparative information is presented for the use of any university transportation planner, and advice is offered on how to go about assessing, for the particular circumstances of each campus, an appropriate combination of "carrot" and "stick" as part of a package of measures to achieve the transportation plan objectives. Evidence is presented to show that students and staff, while realising that these measures are in their own interests, would inevitably jockey for personal or group advantage.

- ii) Identify the potential of manipulation of the lecture timetable to reduce the peak load on parking facilities and on entry and exit conditions.

The advantages of such manipulation are strongly advanced. Regret is expressed that so little use is made of what is, potentially, such a powerful aid to rationalisation of scarce and expensive university facilities.

- iii) Determine correlation between parking supply and demand, viewed against the background of any determining factors.

This correlation is shown. The need for a balance, this balance to be brought about as part of a package of measures to achieve the transportation plan objectives, is stressed. The need, in the circumstances of any particular campus, to assess latent demand (a difficult task ; methods require further research), is noted.

- iv) Determine the implications of alternative methods of allocating parking bays.

These implications are spelled out. Especially the controversial nature of the subject, because of the way it relates to sometimes conflicting assessments of needs and status, is noted.

- v) Review present disciplinary measures.

These are reviewed ; the generally slack enforcement of campus parking regulations and especially the low rate of convictions is deplored. Measures are suggested to tighten enforcement, an essential step if the transportation objectives are to succeed.

- vi) Review the objectives of and progress with transportation plans.

These are reviewed where they exist with, generally, approval, though the absence in certain instances of transportation planning expertise is regretted.

- vii) Identify, quantify and show cause and effect relationships between transportation characteristics of each campus and any determining factors.

These relationships are shown ; the effect of the unique circumstances of each campus in determining its present transportation characteristics, and in affecting the possible success (or otherwise) of planned improvements, is highlighted. The interrelationship of variables in the package of transportation factors is stressed.

- viii) Identify the sources of finance available to universities for transportation improvements.

Present sources of finance are identified. Future possibilities are suggested ; the prospects of such sources being available are commented on.

- ix) Measure the rate of growth of transportation demand. Predict future levels.

Trend directions from past data are pointed out. The paucity of suitable data is regretted. Future directions are predicted, but not in quantifiable form.

- x) Investigate the economics of parking structures.

Further research is called for.

- xii) Investigate reasons for, level of and success of sanctions exercised by university authorities against car usership by selected student groups.

The general use of and fair success of some form of sanctions is noted ; their increase is predicted.

The only two low-priority statements which, due to my personal interest, receive attention equivalent to the foregoing are :

- xii) Measure modal split trends and comment on factors determining it.

What little information on trend data that is available is analysed. Determinant factors are highlighted and discussed at length because of the critical nature of the modal choice on transportation characteristics and on proposed measures to manipulate these characteristics.

- xiii) Comment on bus services and subsidy systems which operate.

These services are commented on in the context in which they operate. The judicious increase in subsidised bus services on a large scale is advocated.

Other project statements which enjoyed a lower priority were investigated, but not in depth.

13.3 APPRAISAL AGAINST THESIS OBJECTIVES

With the exception of a weakness in "possible trends in campus transportation," the specific objectives of this thesis, stated in Chapter 1, are clearly FULFILLED.

REFERENCES

- 1 The reason for this extraordinary precaution is to make it quite clear to the reader when a **campus** rather than the **university** as a whole is being referred to. When a **university** has to be mentioned in the text its name is written in full.
- 2 The following figures were obtained from the answers to Question 2.2 on the 1978 questionnaire. Average increase in enrolment percent per annum "in past few years": UCT 7 to 8 percent ; UWC 15 percent ; UStell 5 percent ; UPE 9 to 10 percent ; URhod 7 percent ; UOVS 10,6 percent ; (average p.a. over seven years) ; UND 2 percent ; UDW 10 percent ; UPret 7 to 8 percent ; RAU 1977 11 percent, 1978 17,8 percent.
- 3 UPE began their move to Driftsands campus in 1972 and completed it in 1974 ; RAU similarly moved to Auckland Park between 1974 and 1975 ; UDW moved to the Chiltern Hills in 1972; UNISA moved to Muckleneuk in 1973.
- 4 For example – "The University of Cape Town has acquired a prestige 140 hectare site on the slopes of the Tygerberg for the probable future development of a satellite campus. The land – twice the area of the existing Groote Schuur campus – has been bought from the Graaff Trust." "Sir Richard (Luyt) said : UCT has been growing each year by several hundred students . . . It is quite clear to us that the (very long-term) needs of higher education could not be accommodated at our Groote Schuur campus." **The Argus**, 27 Feb. 1975.

For a second example – "Building on the new Durbanville campus for the University of Stellenbosch . . . this new campus, on a 225 ha site about three km from the centre of Durbanville." **The Argus**, 24 March 1976.
- 5 The report of the van Wyk de Vries Commission of Inquiry into universities in South Africa recommended that no new universities be established, but " . . . proposed a system under which existing universities can be expanded by establishing branch campuses." **The Argus**, 30 Oct 1974.
- 6 Pinnell C and Wacholder M, **Guidelines for planning in colleges and universities. Volume one – Planning System**, Texas A & M University, Jan 1968, p 7.
- 7 Adapted from *ibid*, p 8.
- 8 Writing in the context of a city, Chapin introduces his classic discussion of transportation and land use relationships with the statement that "transportation is essentially a service which enables people, firms, and various other entities to carry on activities at sites selected for these purposes in separated locations." Chapin I S, **Urban land use planning**, University of Illinois Press, 1965, p 339.
- 9 Driessen sees the effect of land use on planning and vice versa ; writing in terms of city growth, he goes so far as to advocate that, as "the transportation system in turn has a profound effect on the location of various land uses, it can thus be used as an instrument in moulding the future (city) land use pattern." **Report of the Committee of Inquiry into Urban Transport facilities in the Republic (The Driessen Report)**, Government Printer, 1974, p 14.

Perhaps the message is more clearly expressed as follows : "Becoming paramount in our thinking is land use planning to perhaps reduce the need to travel." McKee H, quoted in "Highway design concept teams fail to win support for urban highways," **Engineering News Record**, 6 Dec. 1973, p 32.

- 10 Rees points to the income-redistributive effects, through commuters' transportation expenditure, of government policy. This is of especial significance as long as Non-White staff are employed at White universities. Rees B J, "Group Areas legislation – its impact on urban structure and movement patterns, with special reference to Cape Town," SAICE **Quinquennial Convention**, Johannesburg, 1973.
- Similarly, Daniels describes a Coloured "change-over to the motor car . . . at a stage at which household incomes in fact (do) not yet fully warrant such development. The reasons are related to complex and interdependent economic, social and psychological factors. To give but one example : in the motor car the Black commuter is least exposed to discriminatory treatment by any transport body and the individual is least stigmatized by class or racial criteria." Daniels A F, "Safeguarding the interests of the commuter in a world of changing transport priorities," **Joint Conference on the Driessen Report**, Cape Town Chambers of Commerce and Industries, 1975, p 5.
- 11 "At present 99 percent of students (at the University of Zululand, near Empangeni) are boarders." "Vital need for education and the cost," **Barclays National Review**, March 1977, p 13.
- 12 Only forty out of about a thousand students at the University of Zululand have cars. G Swain (Assistant Director of Physical Planning and Development, University of Natal), interview with, 4 Aug 1973.
- 13 Wall K C, **Transportation aspects of Southern African universities**. Thesis presented in partial fulfilment of the requirements of the degree of Master of Urban and Regional Planning, University of Cape Town, 1971.
- 14 The University of Rhodesia, at Salisbury, was included in the 1971 study. The University of Durban-Westville was excluded, as no data was available from this then brand-new university. Otherwise, the list of universities polled was the same as 1978.
- 15 Wall, K C "An investigation into Southern African campus transportation problems." SAICE **Quinquennial Convention**, Johannesburg, 1973.
- 16 Wall, 1971, p 9.
- 17 Some of this information was collected by myself in 1971 and 1972, when, in anticipation of a M Eng thesis at University of Stellenbosch, with which I did not proceed, I sought to expand my 1970 data base.
- 18 Fink I S, **To and from campus : changing student transportation patterns**, University of California, Berkley, 1974, pp i–ii.
- 19 Research problem statements, **Highway Research Circular**, Highway Research Board, Washington, 1972, p 1.
- 20 Ibid, p 26.
- 21 Ibid, p 25.
- 22 Except UCT. Here two copies were prepared; on the advice of my thesis supervisor, Prof. Granger, one was given to the Director of the Planning Unit (J Elliott) and one to the Senior Administrative Officer, Buildings and Services (J O Watkins).

- 23 My grateful thanks go to the correspondents, viz —
- RAU — R S.de la Bat : Vice Rector.
 UStell — J E Potgieter : Planning Adviser.
 UWC — H J Pienaar : Registrar.
 URhod — J J M van Heerden : Physical Planning Officer.
 UPret — P H S van Zyl : Head, Buildings and Services.
 UND — B E Powers : Physical Planning Officer.
- 24 Elliott, interview, 12 Dec 1977.
- 25 As a matter of interest, the two submissions from UCT, which were completed independently by Elliott and Watkins, are by and large compatible, except for statements 1, 3 and 4 which are ranked higher by Elliott, and statements 11 and 14 which are ranked higher by Watkins. I am unable to draw any significant conclusion from these differences.
- 26 Powers, letter, dd 7 Nov 1977.
- 27 A second criticism of my request was made. Elliott says that the fact that I was asking for comparative data from each university, and not for that university's opinion on which aspects of its own transportation problem needed to be studied, was not entirely clear from my covering letter. I dispute this conclusion : my words are "were you able to compare your standing in respect of that information to the standing of all other universities," Elliot, interview, 12 Dec 1977.
- 28 My grateful thanks go to the correspondents, viz —
- UCT — various (acknowledged elsewhere in this volume).
 UWC — D S Albertyn : University Planner.
 UStell — J E Potgieter : Planning Advisor.
 UPE — P H Kemp : Chief, Technical Services.
 URhod — J J M van Heerden : Physical Planning Officer.
 UOVS — J C Kleynhans : Registrar (Academic).
 UND — B E Powers : Physical Planning Officer.
 UDW — K Naidu : Head, Auxiliary Services.
 UPret — Y Venter : Head, Campus Control.
 PUCHO — J A Steenkamp : pp Registrar (Academic).
 RAU — D J de Kock : Senior Planner.
- 29 i) J F Pienaar (Senior lecturer in transportation engineering, University of Stellenbosch), various interviews, 1972 to 1973.
- ii) L S van den Elzen (Head, Campus Control, University of Stellenbosch, various interviews 1972 to 1973.
- 30 i) A Lap (Director of Works, University of Port Elizabeth), interview and visit to Bird Street and Driftsands campuses, 9 Aug 1973.
- ii) N Nel (Director of Public Relations, University of Durban-Westville) and A A Eybers (Premises and Transport Officer), interview and visit to Chiltern Hills campus, 13 Aug 1973.
- iii) Prof P H Connell (Director of Physical Planning and Development, University of Natal) and G Swain (Assistant Director), interviews and visits to Durban and Pietermaritzburg campuses, 14 and 15 Aug 1973.

- iv) C P Forbes (Assistant Registrar, Witwatersrand University), interview and visit to Jan Smuts Avenue campus, 21 Aug 1973.
 - v) R S de la Bat (Registrar (Finance and Business)) Randse Afrikaanse Universiteit, interview and visit to Braamfontein campus, 20 Aug 1973.
 - vi) C Coetzer (Planning Officer, Universiteit van Pretoria) and B Sandrock and F op den Kamp (of Brian Sandrock, Architect), interviews and visits to Brooklyn campus, 27 Aug 1973.
 - vii) J H Grobler (Secretary of Transport Committee. University of South Africa) and Dr H T Gous (Director, Bureau for University Research, University of South Africa), interviews and visit to Muckleneuk campus, 28 Aug 1973.
- 31 Prof V L Granger, Dean of Engineering, University of Cape Town.
- 32 For a general description of their work see "The Planning Unit," **Fact Paper 13/75** News and Information Bureau, University of Cape Town, 1975.
- 33 Most recent publications are :
- i) Ninham Shand and Partners, **UCT transportation study : project report**, Sept 1975.
 - ii) Ninham Shand and Partners, **UCT transportation study : interim report on policy options**, Dec 1976.
 - iii) Ninham Shand and Partners, **UCT transportation study : report on survey**, July 1977.
 - iv) Ninham Shand and Partners, **UCT transportation study : report on findings**, July 1977.
- 34 References employed in the compilation of this Table include :
- i) Kotzé D J, **Energiekonsumpsie in Suid-Afrika : Historiese Oorsig en Vooruitskatting** M Thesis, University of Stellenbosch, 1967.
 - ii) Welgemoed P J, **Some aspects of the ownership and use of motor vehicles in South Africa**, Transport Research Centre, University of Stellenbosch, 1967.
 - iii) Cillie F P and Burton R W, "Padstatistiek 1970 Road Statistics." **CSIR Special Road Report Pad 22**, CSIR, Pretoria, 1971.
 - iv) **Statistical Year Book 1970**, Bureau of Statistics, Pretoria, 1970.
 - v) **Stats**, Pienaar and Associates (Pty) Ltd, Pretoria, Dec 1970.
 - vi) **Highway Expenditures, Road and Motor Vehicle Statistics for 1970**, International Road Federation, Washington, 1971.
 - vii) **The Europa Year Book 1970**, Europa Publications, London, 1970.
 - viii) Letter dd 6 July 1971 to me from the Government Statistician, Dominion Bureau of Statistics, Ottawa.
 - ix) "**Canada Year Book 1969**," Dominion Bureau of Statistics, Ottawa, 1969.
 - x) Letter dd 5 April 1971 to me from the Australian Embassy, Cape Town.
 - xi) Letter dd 24 May 1971 to me from the Commonwealth Statistician, Bureau of Census and Statistics, Canberra.
 - xii) **Education, Cultural Activities and Research : Australia**, Commonwealth Bureau of Census and Statistics, Canberra, 1968.
 - xiii) **New Zealand Official Yearbook 1969** Department of Statistics, Wellington, 1969.
 - xiv) Letter dd 6 May 1971 to me from the Government Statistician, Department of Statistics, Wellington.
 - xv) Letter dd 2 July 1971 to me from the Office of Population Censuses and Surveys, London.
 - xvi) **Annual Abstract of Statistics 1968**, Central Statistical Office, London, 1968.
 - xvii) **Statistical Abstract of the United States 1970**, Bureau of the Census, US Dept. of Commerce, 1970.

35 By country, the response was as follows :

New Zealand : one out of seven.
Australia : seven out of fourteen.
Canada : seventeen out of thirty.

Non-replies were not followed up, as I had dropped the thesis project at that stage.

36 References employed in the compilation of this Table include :

- i) Cillie, F P and Nicoll, F J, "Road Statistics 1976 Padstatistiek," **CSIR Special Report Pad 34**, CSIR, Pretoria, 1976.
- ii) **South African Statistics 1976**, Dept of Statistics, Pretoria, 1976.
- iii) **Road and Motor Vehicle Statistics for 1976**, International Road Federation, Washington, 1977.
- iv) Paxton J (Editor), **Statesman's Year-Book 1976/77**, MacMillan, 1976.
- v) **Europa Year Book 1977**, Europa Publications, London, 1977.
- vi) **Canada 1976**, Statistics Canada, Ottawa, 1975.
- vii) **Australia Year Book 1975/76**, Australian Bureau of Statistics, Canberra, 1977.
- viii) **New Zealand Official Yearbook 1975**, Department of Statistics, Wellington, 1975.
- ix) **Universities in Britain**, Central Office of Information, London, 1973.
- x) **Statistical Abstract of the United States 1976**, Bureau of the Census, US Dept of Commerce, 1976.

37 Note further, when comparing the one Table with the other, that the increase in students pro rata to the population is at least partly due to a change in the demographic structure of the population. Following the baby boom of the immediate post-war era which caused Lord Robbins, as he viewed the coming shortage of places in the mid-sixties universities, so much concern in 1963, there was a relative decline in the birth rate in the advanced Western countries. The conclusion which may be drawn is that demand for places in universities will not, in the near future, experience the dramatic increase of the last decade. Reported in Layard R, King J, and Moser C, **The impact of Robbins**, Penguin, 1969, pp 14 and 15.

- 38 i) J Tomlin (Administrative Officer, University of Newcastle Upon Tyne), interview and visit, 7 Jan 1975.
- ii) P Bourne (Deputy Registrar, University of Manchester, Institute of Science and Technology), interview and visit, 16 Jan 1975.
- iii) Miss A Barr (Administrative Officer, Oxford University), interview and visit, 27 Jan 1975.
- iv) M W Davies (Senior Administrative Secretary, Bath University of Technology), and Dr W Taylor (University Planner), interview and visit 30 Jan 1975.

39 Universities of Southampton and Cambridge, and Imperial College.

40 Universities of Tel-Aviv, Negev and Beersheva, Jerusalem, and Haifa, and the Technion at Haifa.

- 41 i) De Leuw, Cather, **The University of Calgary Transportation Study**, Calgary, Jan 1970.
- ii) An outline of the physical planning proposals for the growth of the Fort Garry campus, Office of Vice-President (Planning), University of Manitoba, 1971.
- iii) University Planning Office, University of Pennsylvania, **Transportation to and from the campus**, March 1964.
- iv) Urban Mass Transportation Administration, **A bus priority system for traffic signals Kent State University**, 1972.
- v) McKelvey J, **Campus travel behaviour at the University of Iowa ; a problem in applied transportation geography**, Institute of Urban and Regional Research, Iowa City, Aug 1972.
- vi) John Andrews Architects et al, **The University of Minnesota, St Paul Campus. Long-range development plan**, St Paul, June 1972.
- vii) Fink Ira S, **To and from campus : changing student transportation patterns**, Office of the President, University of California, Berkley, Oct 1974.
- viii) Wallace, Stephan, **The campus bus and peripheral parking system**, Office of Traffic and Parking, University of Iowa, Iowa City, 1972.
- 42 i) Blurton, Michael, "Cars and buses get along together in integrated program," **College and University Business**, Dec 1970.
- ii) Carter, Everett C, "Transportation planning for colleges and universities," **Traffic Engineering**, Aug 1974.
- iii) Carter, Everett C., (Chairman, Committee 6J), **Transportation planning for colleges and universities**, Institute of Traffic Engineers, Washington, 1975.
- iv) Guyton, Joseph W and Reed, George L., "Planning for campus traffic and parking," **Transportation Engineering Journal** of ASCE, Feb 1971.
- v) Guyton, Joseph W and Upchurch, Jonathan E., "Campus traffic and parking," **Traffic Engineering**, May 1975.
- vi) Moving people on campus today – and tomorrow," **College Management**, Aug 1971.
- vii) **Parking programs for universities**. University Facilities Research Centre, Madison, Nov 1961.
- viii) Pendakur, V Setty, "Trip generation characteristics of Canadian universities," **Proc. Canadian Good Roads Association**, 1968.
- ix) Pendakur, V Setty, "Access, parking, and cost criteria for urban universities," **Traffic Quarterly**, July 1968.
- x) Pinnell, C and Wacholder M, **Guidelines for planning in colleges and universities. Particularly Volume One – Planning System ; and Volume Three – Physical plant planning**. Texas A & M University, Jan 1968.
- xi) Prytula, George, "Fixed-rail rapid transit is headed for the campus," **College and University Business**, Dec 1970.
- xii) Quillem, Michael J and Yu, Jason C, "Management system for campus traffic planning," **Transportation Engineering Journal** of ASCE, Nov 1972.
- xiii) "The great space race," **College and University Business**, Nov 1970.
- 43 i) Len T Frazer and Associates, **La Trobe University : Report on traffic and parking**, Melbourne, 1968.
- ii) Tindal J I, **Report to University of New England Planning Committee ; Traffic plan ; University of New South Wales**, Feb 1972.
- iii) **Traffic and parking study**, Division of Property and Plans, the Australian National University, Canberra, 1971.
- iv) Williman, A, "The University of Canterbury Travel and Parking Studies of 1962, 1966 and 1971," **Australian Road Research**, June 1973.
- 44 Ogden K W, "Travel characteristics of Australian university students," **Traffic Engineering and Control**, Dec 1973.

- 45 Although the questionnaire was posted early in 1978, the correspondents were asked to provide 1977 data.
- 46 The only significant exception is the University of Natal campus at Pietermaritzburg.
- 47 Data sources as reference 28.
- 48 Wall, 1971, p 14.
- 49 Powers reports (letter dd 7 Nov 1977) that "the University of Natal is employing professional consultants on a traffic and movement study for the Durban campus. The travel study was conducted in April 1976 and a Draft Report has been produced for comment prior to completion of the Final Report in due course."
- 50 I refer here to Mackintosh, Bergh and Sturgess "Stellenbosch Verkeerstudie 1973 — 1985 — 1995," 1975. Strictly speaking, this study was commissioned by the Municipality, but an abnormally large proportion of the town's traffic is, in Stellenbosch, generated by the University.
- 51 de Kock referred me to "Aspects of the traffic planning of the RAU's development plan," by Bruinette, Kruger, Stoffberg and Hugo. Found as Appendix A in **Rand Afrikaans University Development Plan**, by Wilhelm O Meyer in association with Jan van Wijk, June 1968.
- 52 Potgieter, in questionnaire response dated 15 Feb 1978. He then goes on to list the "principles agreed and gradually implemented :
- i) Restrictions on car ownership of students, student on-campus parking, and registration of student cars.
 - ii) Separation of the pedestrian, cycle traffic, and vehicles.
 - iii) Campus development on "superblock" pattern.
 - iv) Consolidation of parking so that a small number of bigger parking areas will replace a big number of smaller parking areas.
 - v) Provision of peripheral parking areas for use by commuters."
- 53 Shand, Sept 1975, p 24.
- 54 Ibid, pp 24 — 27, for the full text.
- 55 Shand, Sept 1975, p 28.
- 56 The University's Traffic Committee "agreed to accept the objectives which the plan was attempting to achieve," with minor following modifications relating to the improvement of the "quality" of the campus particularly in relation to noise pollution, and liaison with the University's administrators for additional planning data. (Minutes of Traffic Committee meeting dd 17 Sept 1976).
- 57 This qualifier "to a large extent" no doubt refers to the desire to confine motor vehicles to the periphery of the campus.
- 58 Bruinette et al, 1968, p 1 of Appendix A. Although this document is ten years old, de Kock confirmed in his questionnaire response that its statement of objectives reflects current thinking.
- 59 Ibid, p 3 of Appendix A.
- 60 **University of Natal Development Scheme. Volume 1 : Site planning proposals, Durban,** University Planning and Development Office, Durban, 1972, p 17.

- 61 The existing buildings are on Berea Ridge, with steep (20 percent) falls to the undeveloped western and northern portions of the campus.
- 62 **UND Proposals**, 1972, p 18.
- 63 *Ibid*, p 30.
- 64 Marais, E J, "The planning philosophy of the new UPE campus," paper read at the **4th Annual Conference of University Technical and Planning Officers**, 28 May 1973.
- 65 From a questionnaire survey to staff and students in 1977. Potgieter, questionnaire response, 1978.
- 66 **Shand Report on survey 1977**, p 10 and Fig. 6. Figures obtained from a questionnaire survey to staff and students in 1974.
- 67 Extract from preliminary findings of questionnaire survey to staff and students in 1976. Forwarded informally to Shands by De Leuw, Cather and Associates Inc., Dec 1976. Figures adjusted to include campus residents.
- 68 **Shand Report on survey**, 1977, pp 42 and 44.
- 69 Data sources as reference 28.
"Inadequate" — UWC, UOVS, UND, UPret and RAU.
"Very inadequate" — UStell and PUCHO.
- 70 Queenswood, Lynwood, Waterkloof, Brooklyn, Groenkloof, Muckleneuk and Bryntirion.
- 71 68 buses each weekday in each direction on the Sunnyside No. 4, Lynnwood and Hatfield routes (the latter terminates at the north-east corner of the campus ; the others traverse Lynnwood Road, its southern boundary). Reference : Municipal bus authority time table, 1976.
- 72 Data sources as reference 28, supplemented by bus timetables.
- 73 Eybers, interview, 13 Aug 1973.
- 74 As it is termed by the municipal bus authority.
- 75 This service to the campus has been termed "appallingly bad." It "runs from the city centre to the university by a very devious route, the city centre being, in any case, off the beaten track for a good proportion of the journeys to and from the University to places of residence." Connell, letter to me, 11 March 1971. Checked by myself "on the spot" 14 Aug 1973. The position has not improved since. (Powers, questionnaire response, 1978).
- 76 Eybers, interview, 13 Aug 1973, and K Govender, (a UDW postgraduate student met in Cape Town), interview, 28 Jan 1978.
- 77 Was R7 500 p.a. in 1973. (Coetzer, interview 27 Aug 1973).
- 78 Grobler, interview, 28 Aug 1973.
It is gratifying to note that the prediction of Sandrock, made while UNISA at Muckleneuk was still in the construction stage, has partially come to pass. "The University has decided to do everything possible, from the outset, to discourage staff from bringing cars to the site. They are going to provide a free bus service, in co-operation with the Municipality, from various points in residential areas with high staff densities, to the

Campus and back." Sandrock, letter to me 5 July 1971 ; quoted in Wall, 1971, p 24.

- 79 Wall, 1971, p 24.
- 80 ie, The cost of printing of parking discs and of traffic information. Not the cost of salaries of traffic officers or of associated clerical staff, which are accepted as part of the normal administrative budget of the University ; nor the cost of construction of parking spaces, which is a normal "minor capital works" expense which the University budget is expected to meet. Watkins, interview, 17 Nov 1977.
- 81 Whereas all full-time students pay the levy whether they use the bus or not, staff can, if they wish to use the bus, buy an annual bus ticket (which costs the same as the levy). If they wish to use their car, they must purchase a parking disc, and with that they get a free annual bus ticket, the idea being to remove at least one psychological obstacle (perceived marginal cost) in the way of their using the bus, and thereby encouraging them to leave the car at home. Watkins, interview, 17 Nov 1977.
- 82 Approved by the Traffic Committee at its meeting 13 Oct 1977.
- 83 Attachment "B" to Traffic Committee minutes, meeting of 13 Oct 1977. In round figures, the estimates are :

| Revenue | | Expenditure | |
|----------------|----------|----------------------|----------|
| Parking fees : | | Bus service : | |
| Staff | R19 000 | To City Tramways | R96 000 |
| Students | R21 000 | Ltd. | |
| Combined | R1 000 | To "Student Affairs" | R2 000 |
| | | bus. | |
| | R41 000 | | R98 000 |
| Traffic fines | R1 000 | General admin. | R3 000 |
| Bus tickets | R3 000 | Contingency (petrol | R4 000 |
| Student levy | R60 000 | price increase) | |
| | R105 000 | | R105 000 |

My thanks go to Mr L Read (Registrar) and Prof Granger for permission to quote from the minutes of the Traffic Committee.

- 84 Hence the turning-down of the recent request from staff and students at Belhar (numbering about twenty persons) for one bus per day in each direction. Watkins, interview, 23 Nov 1977.

Note that the private bus company, City Tramways Ltd, are reported to be happy to run any bus routes which UCT might propose, provided the service is guaranteed by the University! Watkins, interview, 17 Nov 1977.

- 85 Shand **Report on survey** 1977, pp 54 to 56.
- 86 Ibid, p 59.
- 87 Watkins, Memorandum to the Chairman of the Traffic Committee, University of Cape Town, 1 Sept 1977. Also Watkins, interview, 17 Nov 1977.
- 88 Householders from the Chiltern area crossing the campus to reach the National Road.

- 89 Reference has already been made to one problem of this road. See Section 7.5.3 above.
- 90 "Briefly, the two-level solution proposed provides for a deck at a level of about 6 metres above the present roadway, which remains unaltered. (The deck would be) open to one side and with openings in the deck itself along the axis of the road to provide adequate ventilation The upper deck . . . is established at a level which relates reasonably well to the levels of the entrances of the existing buildings." UND **Proposals**, 1972 p 44.
- 91 " from the University's standpoint the simpler solution of interrupting the road to form a pedestrian precinct . . . appears to be the correct and appropriate one." Ibid, p 45.
- 92 "There is no objection, in principle, to the proposal to construct the Library across King George V Avenue and the erection of overhead pedestrian bridges . . . Council is unable to support the closure of King George V Avenue as a public street." Letter dated 22 April 1973 from Town Clerk of Durban Corporation to Principal of University of Natal.
- 93 "It must be emphasized at this point that the University will never be able to develop a proper campus centre on the Durban site unless a workable solution to the problem of King George V Avenue can be evolved and carried through to completion." UND **Proposals**, 1972, p 11.
- 94 Powers, letter to me dd 31 March 1978.
- 95 Taken on 2 Sept 1977.
- 96 Data sources :
UCT – Shand **Report on survey**, 1977, pp 37 and 41.
UStell – Potgieter, questionnaire response, 1978.
UPE – Kemp, questionnaire response, 1978.
No other campuses had these measurements available.
- 97 Data sources as reference 28 except for :
UCT – Shand **Report on survey**, 1977, pp 50 to 54.
UOVS – Supplemented by a letter dd 6 April 1978 from Kleynhans.
UND – de Leuw, Cather via Shand, 1976, and letter dd 6 April 1978 from Powers.
UWits – Supplemented by a letter dd 31 Jan 1977 from D A Sleeman (Planning Officer) to Ninham Shand and Partners Inc.
UPret – Supplemented by a letter dd 11 April 1978 from Venter.
- 98 UPret's attitude is clearly set out as follows : "In order to maintain a peaceful study atmosphere and less danger to pedestrians, traffic in the heart of the campus is restricted to the minimum. With this thought in mind, parking is provided as far as possible on the periphery of the campus. The University Council does not accept responsibility for personnel and student parking but attempts are made, as far as possible, to provide suitable parking places for personnel. Students' vehicles are not allowed on campus because of lack of space." (Translation from Afrikaans.) Letter dd 11 Feb 1977 from Director, Physical Planning and Business Administration, University of Pretoria, to Ninham Shand and Partners Inc.
- 99 Taken at different dates in March and April 1978.
- 100 At UCT, for example, the relative proportions in 1977 were :

| | |
|---|-----|
| i) Numbered bays for senior staff | 342 |
| Numbered bays for students in residence on campus | 136 |

| | |
|---|-------|
| ii) Bays in staff pool, identified by painted yellow rectangles | 411 |
| iii) "Open" bays | 899 |
| iv) Loading and visitors | 36 |
| Total | 1 824 |
| v) "Undefined areas" : maximum capacity | 300 |

(Sources —

— (i) to (iv) , Report of Chief Traffic Officer in Traffic Committee minutes of 16 Sept 1977 meeting.

— (v) Shand, **Report on survey**, 1977, p 50.)

- 101 Previously I used the term "illegal" to include "parking in any area which is not marked out or otherwise indicated as a parking space." (Wall, 1971, p 33). The term "illegal parking" is however more strictly applicable to cars parking in bays when these cars either displayed the wrong parking disc (eg. student in a reserved staff bay) or did not display a disc at all, or when these cars parked in areas marked "no parking" as such. "Undefined parking areas" is a more realistic term to describe the opportunistic use for parking of verges, strips of unbuilt land, or unmarked kerbside. See photos 15 to 20.
- 102 Kleynhans, questionnaire response, 1978.
- 103 Kemp, questionnaire response, 1978.
- 104 Swain, interview, 14 Aug 1973.
- 105 "The decision of the City Engineer was based not only on the parking requirements of the University, but also on the rapid development of Braamfontein immediately south and east of the university campus as a commercial and industrial area in which the parking congestion has already reached alarming proportions." Forbes, letter from, 23 June 1971. Confirmed by J Withrow (of Bruinette, Kruger, Stoffberg and Hugo), interview 22 Aug 1973.
- 106 "Advantage was taken of the steep fall in the ground from Central Block to Jorissen Street to create a large and much needed parking area for 300 cars, the roof of which forms a podium on which the rest of the complex sits." "Senate House," **Planning and Building Developments**, March/April 1977, p 5.
- 107 Grobler, 28 Aug 1973. Also personal observation of the same date. The balance of the 485 spaces at UNISA are on conventional lots elsewhere on site.
- 108 Wall, 1971, p 33.
- 109 Data sources as reference 28 with the addition of :
- UCT — University of Cape Town : **General Prospectus** 1977, pp 170 to 173.
Wilson, interview, 17 Nov 1977.
Watkins, interview, 17 Nov 1977.
- UStell — Universiteit van Stellenbosch : **Jaarboek** 1977, pp 27 to 28.
- UND — Powers, letter from, dd 6 April 1978.
- UWits — Sleeman to Shand, 1977.
- 110 There are only 250 bays for student use at UWits, excluding the showgrounds, Yale Road flyover, and beyond Empire Road. A subcommittee of the SRC allocates 150 of these to deserving students, and the remaining 100 are balloted for, the winners paying R20 for the privilege of being allocated a bay. Source : Sleeman to Shand, 1977.

- 111 Ibid.
- 112 Sub-section 7.5.4 above.
- 113 Not that this meets with universal approval. The UCT Staff Association, at a meeting 4 June 1976 agreed that, while "the Association would like the bus service to continue," it would "press for a separation of the bus service, and the way it was financed, and the parking issue. It was felt that in principle staff parking fees should no longer be used to support the bus service." Quoted in minutes of Traffic Committee meeting dd 17 Sept 1976.
- 114 De Kock, questionnaire response, 1978.
- 115 University of Durban-Westville : **Traffic Regulations**, 1977, p 72.
- 116 I have no doubt that the decision to tighten up at UCT, described below, is at least partly due to the revelation that 22 percent of those parking at UCT at the peak hour have no discs. "If these persons are not dealt with, there will be no incentive for other users to adhere to the regulations." Shand, **Report on findings**, 1977, p 7.
- To illustrate — nearly 8 000 tickets issued at UCT between March and September 1977 raised less than R3 000 in fines, despite the scale of fines listed in Sub-section 7.9.4 above. Source : Minutes of Traffic Committee meeting dd 16 Sept 1977.
- 117 Ibid.
- 118 "Report of sub-committee re traffic regulations" (Adv. H J Swart, Convenor). Traffic Committee minutes, meeting of 17 Sept 1976.
- 119 Report from the University's legal advisers. Traffic Committee minutes, meeting of 6 Jan 1977.
- 120 A note in respect of the techniques of pedestrian traffic prediction — an interesting "physical affinities pattern" is shown in University of Cape Town Planning Unit, **Report No. 1 Analytical Studies**, 1971, p 7/3. Chapter 7 of this report is based on research and calculation by Ninham Shand and Partners.
- 121 See Section 7.3 above.
- 122 See Sub-section 7.6.1 above.
- 123 Brian Sandrock Argitekter, **Universiteit van Pretoria Langtermynbeplanning**, Pretoria, Feb 1965, p 40.
- 124 Bruinette, Kruger, Stoffberg and Hugo, **Universiteit van Pretoria : Roperstraat Verkeerstudie**, Pretoria, Aug 1970.
- 125 "Human Sciences Building, Pretoria University," **Planning and Building Developments**, May/June 1977, p 13.
- 126 "Die gebou is so beplan dat dit Roperstraat sal oorbrug tussen die hoof- en oorskampus op so 'n wyse dat dit 'n veilige voetganger deurgang deur die gebou oor Roperstraat sal vorm." **Skakelblad**, Universiteit van Pretoria, Feb 1973, p 17.
- 127 Shand **Report on findings**, 1977, p 13.
- 128 Ibid, p 57.

- 129 Ibid, p 58.
- 130 **UND Proposals**, 1972, p 27.
- 131 Ibid, p 26.
- 132 Ibid, p 27.
- 133 University of Cape Town Planning Unit, **Middle Campus design studies 1976**, Oct 1976, paragraph 8.3.
- 134 Data sources as reference 28 with the addition of :
UCT – Elliott, interview, 12 Dec 1977.
- 135 UND – Powers, letter from, dd 31 March 1978.
- 136 See Section 8.3 below.
- 137 Sources for this Section are :
- i) H M Erasmus (Department of National Education), letter, 6 July 1971.
 - ii) Forbes, letter, 6 July 1971.
 - iii) "Die Kapitaalprogram," in **Die RAU na vyfjaar**, RAU, 1973.
 - iv) Swain, interview, 14 Aug 73.
 - v) "State aid of 85 percent proposed," **The Argus**, 30 Oct 1974. (Press report on the proposals of the Commission of Inquiry into Universities (the Van Wyk de Vries Commission)).
 - vi) P W Lee (Chief Accountant, University of Cape Town), telephone conversation, 13 March 1978.
- 138 The Van Wyk de Vries Commission was not in favour of continuing the present system of central government (State) contributions linked to the university's own ability to pay. "Instead it proposed that the State finance the capital needs of the universities for land and building in full, with the community round a university paying an annual contribution to capital costs based on the number of students." **The Argus**, 30 Oct 1974.
- 139 Based on :
Granger, interview, 14 Oct 1977.
Watkins, interview, 17 Nov 1977.
Elliott, interview, 18 Jan 1978.
Skakelblad, Universiteit van Pretoria, Feb 1973.
- 140 The purpose of a Building Committee has been well described "om die beleidsaspekte ten opsigte van bouwerk en verbandhoudende aangeleenthede te behandel en die Raad daarvoor te adviseer." **Skakelblad**, Feb 1973, p 9.
- 141 Minutes of SRC meeting, 5 April 1972, University of Cape Town.
- 142 Letter to me dd 11 April 1972 from Peta Jones, Chairman, Campus Affairs Committee of the SRC, University of Cape Town.
- 143 i) Undated staff circular, University of Cape Town.
ii) D C Robertson (Consulting engineer), interview, 20 Aug 1973.
- 144 Circular dd 11 Sept 1973, signed by Pete Ravenscroft, Chairman, Traffic Committee of the SRC, University of Cape Town.
- 145 Undated handbill entitled "Parking campaign at UCT."

- 146 As described in Sub-section 7.5.4 above.
- 147 Minutes of the Traffic Committee meeting dd 13 Oct 1977, University of Cape Town p 4.
- 148 See comment on the present bus services in Sub-section 7.5.4 above.
- 149 Govender, 1978.
- 150 Derived from figures on pp 4 and 5 of **Work paper No. 4 : Transport survey**, University of Cape Town Planning Unit, 1970. (This work paper was actually written by Ninham Shand and Partners.)
- 151 Wall, 1971, p 29.
- 152 Ibid, p 28.
- 153 The students who, in former years, would gather at the foot of Woolsack Road and hitch a lift up the hill.
- 154 See Sub-section 7.5.4 above.
- 155 Students represented 85 percent of all bus travellers ; 13 percent were staff members engaged in administration and technical work or as labourers and domestics ; the lecturing staff made up only 2 percent of bus travellers. Shand **Report on survey**, 1977 p 58.
- 156 Wall, 1971, p 29.
- 157 See Sub-section 7.10.1 above.
- 158 See Sub-section 7.6.1 above.
- 159 See Sub-section 7.6.2 above.
- 160 Shand **Report on survey**, 1977, p 46.
- 161 Wall, 1971, p 49.
- 162 Elliott, interview, 12 Dec 1977.
- 163 Unpublished. Recorded in Senate papers, 1973.
- 164 Wall, 1971, pp 36 and 37.
- 165 "The Committee expressed its concern over the inadequacy of available parking on the Groote Schuur campus and recommended that the provision of a gravelled surface parking area in the trees above Ring Road be investigated vigorously and timeously." Minutes of Traffic Committee meeting dd 13 Oct 1977, p 4. The early construction of this same parking area was recommended by the consultants. Shand **Report on findings**, 1977, p 68.
- 166 See Section 7.8 above.
- 167 Guyton and Upchurch, 1975, p 17.
- 168 V Setty Pendakur. "Access, parking and cost criteria for urban universities," **Traffic**

- Quarterly**, July 1968, pp 359 to 387.
- 169 Ibid, p 361.
- 170 Ibid, p 362.
- 171 Ibid, p 362.
- 172 Guyton and Upchurch, 1975, p 16.
- 173 Keefer, L E , and Witheford, D K, "Urban travel patterns for hospitals, universities, office buildings and capitols," **National Co-operative Highway Research Program Report 62**; Highway Research Board, Washington, 1969.
- 174 Pendakur, 1968, pp 368 and 380.
- 175 Ibid, pp 368 and 380.
- 176 **Parking Programs for Universities**, University Facilities Research Centre, Madison, Wisconsin, 1961, pp 4–5.
- 177 The highest proportion, one-third, is found in the case of UStell.
- 178 Planning Unit, **Analytical studies**, 1971, p 7/3. The actual increase, with only three years to run until 1980, is only 6 percent.
- 179 See Sub-section 7.9.1 above.
- 180 Pendakur, 1968, p 362.
- 181 Wall, 1971, pp 41 and 42.
- 182 A brand-new parking garage in the very centre of Cape Town charges R22 per month for a guaranteed bay. "Golden Acre Garage is partly completed," **The Argus**, 8 Oct 1977.
- 183 See Section 7.11 above.
- 184 Report of the Sub-committee re traffic regulations (Adv. H J Swart, Convenor), 30 Aug 1976. Two objections were given :
- i) The university will have to take responsibility for the safe-keeping of vehicles.
 - ii) Severe embarrassment may result if action is taken in respect of vehicles belonging to bona fide guests or visitors to the University."
- 185 Respectively, in Sections 7.2 and 7.11 above.
- 186 See Section 7.3 above.
- 187 UND **Proposals**, 1972, p 17.
- 188 See Chapter 6 above.

189 My grateful thanks go to the correspondents, viz :

University of Waikato — R B Grant : Registrar.
 Australian National University — A A Robertson : Assistant Registrar (Development).
 Macquarie University — W V Abraham : Architect-Planner.
 Monash University — J D Butchart : Academic Registrar.
 University of New England — C A Amos : Buildings Officer.
 University of Western Australia — A J Williams : Registrar.
 University of Alberta — W J Williamson : Research Officer, Institutional Research and Planning.
 University of British Columbia — J A Kamburoff : Architect, Design and Planning, Department of Physical Plant.
 Brock University — A A Tunis : Registrar.
 University of Calgary — V Swanberg : Project Officer, Campus Planning.
 University of Guelph — K D Opare : Assistant for Planning and Administration.
 McGill University — S B Frost : Vice-Principal (Administration and Professional Faculties).
 Manitoba University — D B McMillan : Campus Planning Officer.
 University of New Brunswick — E C Garland : Director of Academic and Campus Planning.
 Notre Dame University of Nelson — E D Baravalle : Registrar.
 University of Ottawa — R Boss : Director, Public Relations.
 Queen's University — G Andrews : Associate Professor, School of Urban and Regional Planning.
 University of Saskatchewan — J A E Bardwell : University Secretary.
 University of Western Ontario — A Pulker : Administrative Assistant to the Registrar.
 University of Winnipeg — J G Pincock : Assistant to the President, Planning and Development.
 York University — R C Howard : Campus Planner.

And also to the anonymous correspondents at La Trobe, Sydney, Lakehead and Laval.

- 190 Australian National, 1971.
- 191 Frazer, 1968.
- 192 Ogden, K W, "Travel Characteristics of Australian Universities." **Traffic Engineering and Control**, Dec 1973, pp 398 — 401.
- 193 Ibid.
- 194 Tindal, 1972.
- 195 A J Diamond and Barton Myers, Planners, **University of Alberta Long Range Development Plan**, 1969.
- 196 i) John Graham Consultants, **University of British Columbia Traffic and Parking Proposals**, 1966.
 ii) Pendakur, "Canadian Universities," 1968, p 523. Reworked to allow for students in residences.
- 197 De Leuw, Cather, **Calgary**, 1970.
- 198 Manitoba Vice-President, 1971.
- 199 "It is known that the university route of the Transit authority is the **only** one in the city to show a profit." McMillan, questionnaire response, 1972.

- 200 According to Williamson, in the colder regions of Canada the modes swing 10 percent either way with change in season. Minus 30^o F is "common" in Alberta.
- 201 See also the reference by Pendakur (quoted in Sub-section 8.4.2 above) to the availability of parking space causing a greater demand for space.
- 202 Three RSA campuses out of thirteen had modal split figures available (Table 4). This compares with eleven out of twenty-four overseas campuses (Table 9) ; this response would certainly have improved since 1971. Against this, the possibility must be borne in mind that the overseas universities that bothered to reply to my questionnaire are those more interested in transportation matters and thus more likely to have carried out a transportation study ; my sample is thus possibly unrepresentative.
- 203 Mc Millan, questionnaire response, 1972.
- 204 "Parking policy," **Queen's Gazette**, Queen's University, Sept 1970.
- 205 Saskatchewan provides a further thought on individual bays versus a "pool" system. "At peak demand time probably less than 5 percent of the student spaces stand vacant. This is because these stalls are not assigned to individuals. The University administration has found it can "oversell" the space to the extent of 15 percent and still meet the demand." Bardwell, letter dd 18 May 1972.
- 206 **Traffic and Parking Regulations**, University of Alberta, undated.
- 207 Williamson, questionnaire response, 1971.
- 208 Boss, questionnaire response, 1971.
- 209 **Parking Regulations**, University of Guelph, undated.
- 210 Respectively one and four out of a committee of seventeen at Western Ontario. **Vehicle Parking and Traffic Regulations**, University of Western Ontario, undated.
- 211 Pendakur, "Canadian Universities", 1968, p 515.
- 212 True also of Canada or RSA.
- 213 Ogden, 1973, p 398.
- 214 University Planners, Architects and Consulting Engineers, (UPACE), **Brock University Master Plan**, 1966.
- 215 Tindal, 1972, p 10.
- 216 Based on Tindal, 1972, pp 10 to 11 ; Diamond and Myers, 1969, Chapters 4 and 5 ; and Manitoba Vice-President, 1971, p 25. Also : "The plan is intended to serve a campus which is a pedestrian preserve in the core and maintains the necessary spatial layout for short interval class changes. Penetrator roadways terminating in loops are developed at the major entrances to the campus on the north and south." De Leuw, Cather, **Calgary**, 1970, p 7.

See also site planner's objectives in Australian National, 1971, p 2. "These objectives aim to achieve a system which :

- i) Gives immediate access from the public roads to car parks located as near as possible to places of study and work.

- ii) Segregates vehicular traffic from the main lines of pedestrian movement.
- iii) Provides safe and efficient communication between buildings.
- iv) Facilitates service access throughout the University.
- v) Integrates the internal road system and points of entry to the campus with the civic patterns of approach roads.
- vi) Inhibits the use of University roads by non-University-oriented travellers.
- vii) Reduces traffic noise and disturbances near research, teaching and residential buildings.
- viii) Provides access to buildings for elderly or infirm people, those whose activities include the carrying of heavy loads, VIP visitors, etc.

Naturally some of these objectives and general traffic and parking desiderata are not mutually reconcilable. Some compromises must be made, not the least of which are compromises between what is desirable and what can be afforded."

217 Graham, 1966, p 18.

218 Ogden, 1973.

219 For La Trobe and Monash, see Table 9. Melbourne's statistics are :

| | |
|------------------|------------|
| Car driver | 30 percent |
| Car passenger | 15 percent |
| 2-Wheel | 6 percent |
| Public transport | 11 percent |
| -- train | 15 percent |
| -- tram or bus | 23 percent |
| Walk | |

(Refer Ogden, 1973, p 400.)

220 Ogden, 1973, p 400.

221 Williman, 1973, pp 21 and 22.

222 Tindal, 1971, p 19.

223 This is high at the University of Canterbury (28 percent use by students, 15 percent by staff.) Williman, 1973, pp 9 to 11.

224 Ibid, p 22.

225 University of Alberta, University of British Columbia, and Simon Fraser University.

226 Pendakur, "Canadian Universities," 1968, p 524.

227 Ibid, p 526.

228 Ibid, p 527.

229 Ibid, p 529.

230 Ibid, p 533.

231 Manitoba Vice-President, 1971, pp 43 and 44.

232 Ibid, pp 44 to 46.

- 233 Ibid, p 43.
- 234 Williman, 1973, p 21.
- 235 Ogden, 1973, p 400.
- 236 Williman, 1973, p 21.
- 237 Note that there has over the years been a general increase, at RSA universities too, of the proportion of both women students and postgraduates.
- 238 Due to the extreme winter cold, some Canadian universities have enclosed inter-building pedestrian corridors forming a continuous network through the campus.
- 239 Manitoba Vice-President, 1971, p 29.
- 240 See Sub-section 9.2.4 above.
- 241 See especially the explicit graphic on p 29 of Australian National, 1971. "Council's support in principle for structure parking to be exploited to the full to protect the site from the inevitably degrading effect of motor traffic, and particularly parking." Ibid, p1.
- 242 Although any prices quoted are outdated, the principle of any argument remains valid.
- 243 Compiled from Australian National, 1971, pp 54 to 56 ; Manitoba Vice-President, 1971, Appendix 2.2 ; and de Leuw, Cather, **Calgary**, 1970, p 15.
- Note that the calculations in these three reports, made under widely varying circumstances and assumptions, agreed quite well. Among the assumptions generally made were :
- i) Capital costs of surface parking amortised over 10 years. The cost includes lighting.
 - ii) The remote parking lot is at least 2 000 stalls in size, serviced by shuttle buses with a round trip distance of 2 miles.
 - iii) The multi-storey structure is entirely above ground level. Capital costs amortised over 30 years. Basement parking would increase the cost ratio to 10 vice 7.
- 244 De Leuw, Cather, **Calgary**, 1970, p 16.
- 245 Roth, Gabriel, **Paying for Roads**, Penguin, 1967, pp 33 to 39.
- 246 Australian National, 1971, p 69.
- 247 The only case is Calgary. "The University has provided a free peak hour bus service between a free parking lot at McMahon Stadium and the campus." De Leuw, Cather, **Calgary**, 1970, p 7.
- 248 Diamond and Myers, 1969, p 13.
- 249 Australian National, 1971, pp 56 to 64.
- 250 Study by the Chairman, Building and Grounds Committee, on financial implications of site plan proposals for parking.

"While present ANU policy provides money for site works including levelling the surfacing of surface car parks, it must be assumed that ANU is unlikely to make money available in the near future for parking structures. These will therefore have to be funded from other sources. Possible sources could be one or several of the following :

- i) Accumulated revenue from parking charges on vehicles parking in existing or additional surface car parking spaces.
- ii) Loans from financial institutions basically amortised through future parking revenue.
- iii) Other University funds.

Of these, (iii) is unlikely to contribute significantly.

Indications are, therefore, that provision of adequate parking can only be funded through early imposition of parking charges. Before however putting forward proposals for such charges which clearly will be hotly debated by all sections of the University, it is recommended that :

- i) Information be obtained from the National Capital Development Corporation on their future policy with respect to charging of fees for parking in the general Civic area.
- ii) A study be undertaken of the costs of providing parking facilities and the associated landscaping over the next 15 years and the cash flow required from parking fees to finance such facilities.

It should be stressed that this study is not at this stage intended to provide a recommendation on future University policy but rather to provide the financial data on which such policy recommendations might be based."

Reproduced in Australian National, 1971, p 85.

251 Australian National, 1971, p 56.

252 Further : "The idea of charging extra for the undercover parking provided by structures has been examined but it appears to involve administrative and functional complications which make such an arrangement unattractive. As most grade parking will be closer to work places than the structures proposed, the benefits of undercover parking can be regarded as a compensation for the longer walk which will generally be involved." Ibid, p 68. With all due respect, I do not believe either statement.

253 "Approximately \$60 per annum on all site parkers." (Remember this was in 1971).Ibid p58.

254 Ibid, p 57.

255 Ibid, p 63.

256 Ibid, p 7.

257 Ibid, p 62.

258 Ibid, pp 65 to 68.

259 Manitoba Vice-President, 1971, p 31.

260 Tindal, 1971, p 19.

261 Ibid, p 15.

262 Manitoba Vice-President, 1971, Appendix 2.1.

263 The universities are, respectively, Carleton (in Ottawa), McMaster (in Hamilton, Ontario) Memorial (in St John's, Newfoundland), and Simon Fraser, a university established in the 1960's within metropolitan Vancouver.

- 264 Pendakur, "Canadian Universities," 1968, pp 520, 521 and 535.
- 265 Ibid, p 526. Quoted in Sub-section 9.3.2 above.
- 266 The terms "by congestion," "by pricing" and "by edict" come from pp 7/5 and 7/6 of University of Cape Town Planning Unit, **Report No. 1 : Analytical Studies**, 1971.
- 267 Pendakur, "Canadian Universities," 1968, p 533.
- 268 Ibid, p 535. Also in Table 10, "Recommended parking space provision."
- 269 Ibid, p 534.
- 270 Australian National, 1971, p 63.
- 271 Johnson R, **Griffith site planning report**, Griffith University, 1973. Quoted in H Myles Wright, "The design of universities," **Town Planning Review**, July 1974. The Campus for the new Griffith University is situated in Brisbane. "Public transport to the site is likely to remain bad." Myles Wright, p 247.
- 272 Frazer, 1968, p 11.
- 273 Diamond and Myers, 1969, p 13.
- 274 UPACE, 1966, pp 8.1 and 8.6.
- 275 De Leuw, Cather, **Calgary**, 1970, pp 4 to 6.
- 276 Manitoba Vice-President, 1971, p 33.
- 277 Pendakur, "Canadian Universities," 1968, p 535.
- 278 Wall, Kevin, Discussion on "Planning for Campus Traffic and Parking" , **Transportation Engineering Journal** of ASCE, Feb 1972, p 147.
- 279 See Sub-section 9.3.4 above.
- 280 "Up to now, the use as car parks of sites reserved for future buildings has enabled universities to meet within their own land all or most of demand. Until the oil crisis of last year, it appeared certain that before long university car-owners would have to pay for multi-storey car parks, or go without parking places. In early 1974, it appears that the rate of university building and of increase in numbers of cars may both slow down, and so postpone the Redbrick car park crisis till 1980." Myles Wright, 1974, p 253.
- 281 As a matter of interest, their total student enrollment in the 1971-1972 academic year came to a whopping 105 000! Fink, Ira, **To and from Campus : Changing Student Transportation Patterns**. University of California, Office of the Assistant Vice-President (Physical Planning), Berkley, Oct 1974, p 21.
- 282 At the ninth campus, 28 percent of the students used cars and 36 percent used public transit. Ibid, p 9.
- 283 Ibid, p 22.
- 284 Ibid, pp 22 to 26.
- 285 Ibid, p 52.

- 286 "For example, although cars are owned by 51 percent of all university students living within one mile of campus (excluding those living on-campus) only 7 percent of the students living within one mile drove to campus. Thus, the probability of car use among this group was 14 percent. Stated another way, 86 percent of cars owned by students living within one mile of campus are not used as a means of transportation to campus ; they would be stored at the place of residence." "At greater distances from campuses, the probability of a car owner using his car increases dramatically," until for car owners living more than ten miles from campus it is certain (100 percent probability) that they will use their cars. Ibid, p 64.
- 287 Manchester Education Precinct, 1965, p 80. Quoted in Bullock N, Dickens P and Steadman P, "A theoretical basis for university planning." **Land Use and Built Form Studies**, Cambridge University School of Architecture, 1968, p 262.
- 288 Pennsylvania, 1964, p 4.
- 289 Ibid, p 14.
- 290 Tomlin, interview, 1975.
- 291 Fink, 1974, p 283.
- 292 Though in this case, to use another farmyard metaphor, it is difficult to tell which came first – the chicken or the egg? As Fink admits : "The most important factor contributing to high bicycle use is that the campus administration has made special efforts to encourage the use of bicycles." Ibid, p 95.
- However whereas bicycle use increased most at the two campuses where cycling was always popular and where it was encouraged, there was a substantial University-wide increase in cycling. In 1966, 12 percent of students cycled to campus ; in 1972, 21 percent did. All other modes reduced. Ibid, p 48.
- 293 Ibid, pp 26 and 27.
- 294 Ibid, p 27.
- 295 Ibid, p 28.
- 296 "Parking as an alterant to the traffic pattern." **Highway Research Record 474**, Highway Research Board, Washington, 1973.
- 297 Fink, p 30.
- 298 Segelhorst, E W, and Kirkus, L D. "Parking bias in transit choice." **Journal of Transport Economics and Policy**, Jan 1973, p 59.
- 299 The survey was, unfortunately, only concerned with staff members and not with students. Bevan D, Forsyth P and Munby D, **University of Oxford : university travel and parking survey**, Oxford University Press, 1972, pp 59 to 62 and 71 to 72.
- 300 As discussed on Ibid, p 59. Particularly :
- i) People may give dishonest answers hoping to influence the policy decision that they suspect may lie behind the question.
 - ii) Even if they answer honestly, they are still only guessing at their own behaviour in circumstances of which they have no experience.

- 301 Roth G J, **Parking space for cars : assessing the demand**. Cambridge University Press, 1965, p 57.
- 302 Bevan et al, 1972, p 31.
- 303 Fink, 1974, pp 38 to 46.
- 304 Edited by Lovelock, C H, "Balanced Transportation Planning for Suburban and Academic Communities," **Final Report of the Stanford (University) Workshop on Transportation Planning**, Stanford Workshops, Dec 1971. Quoted in Fink, 1974, pp 2 and 3.
- 305 Fink, 1974, p 4.
- 306 Ibid, p 5.
- 307 Included are recommendations :
- i) To ensure that all persons are fully informed as to all modes of travel alternative to autos.
 - ii) That the campus take the initiative in encouraging formation of car pools and institution of charter bus services.
 - iii) That transit authorities be encouraged to reduce fares to boost patronate during off-peak hours.
 - iv) That reduced rate transfers be arranged between the services of various transit authorities.
 - v) That the use of bicycles should be encouraged. (Lanes, safety markings, lock-up parking facilities).
 - vi) That studies be initiated to ascertain the potential that staggered working hours has for reducing peak traffic demands.
 - vii) That all free parking on campus should be eliminated except for handicapped drivers and emergency vehicles, and that a compulsory annual car registration fee should be levied on all students and staff wishing to park their vehicles on campus. Ibid, pp 287 to 292.
- 308 Carter E C, Chairman, and Committee 6J, ITE Technical Council. **Transportation Planning for Colleges and Universities**, Institution of Traffic Engineers, 1975, p 11.
- 309 Studies of traffic and car-parking, prepared by Colin Buchanan and Partners. In Robert Mathew, Johnson-Marshall and Partners, **The Proposed University of Bath : a Technological University, Development Plan, Report Number 1**. Bath. University Press, 1965, p 56.
- 310 Ibid, p 56.
- 311 Ryall P C, "Southampton University transportation survey," **Journal of the Institution of Highway Engineers**, Sept 1968, p 35.
- 312 My visit to campus, 23 Dec 1974.
- 313 These are, with my own commentary :
- i) Connect integrally with bus service on campus. (Could be the same bus).
 - ii) Charge a nominal cost, which must be annually assessed, ie. so that it is not perceived as a cost of undertaking each new journey.
 - iii) Attract students who generally travel to campus as "auto-passengers" or "hitch-hikers." (If it does not attract these, it stands no hope of attracting car drivers).
 - iv) Develop routes which include the student residential areas between three and ten

miles of campus.

Fink, 1974, p 37.

- 314 Using the Santa Cruz campus experience as an illustration, Fink states that if it was wanted "to reduce the number of students driving cars to campus and increase the number of students using public transportation, it would be necessary to limit the number of students who are allowed to have cars on campus."
Ibid, p 286.
- 315 "Student-run free bus service ; eases parking, cuts pollution," **Highway Research News No. 53**, Highway Research Board, Winter 1973, pp 17 to 19.
- 316 While the article makes a great play of the numbers of patrons, the proportion they form of the original modal split has to be deduced. The "ten percent" is my figure.
- 317 Carter, 1975, pp 10 and 11.
- 318 Blurton, Michael, "Cars and buses get along together in integrated program," **College and University Business**, Dec 1970, pp 53 to 55.
- 319 Dueker K J and Stoner, James, "Examination of improved transit service." In "Public transportation for small and medium-sized cities, **Highway Research Record No. 419** Highway Research Board, 1972, p 32.
- 320 Out of 20 000 University of Iowa students. Ibid, p 35.
- 321 John Andrews Architects, Bather Ringrose Wolsfeld Inc., and David Scott Consultants Ltd. **The University of Minnesota, St Paul Campus, Long Range Development Plan**, June 1972, p A5 – 14.
- 322 Ibid, p 84.
- 323 To carry the argument further : "The inequity created by subsidizing only auto becomes more obvious when congestion is included. Two equally productive employees who receive the same wage rate, and ride transit, are both offered free parking. One employee switches to auto, and is compensated with the subsidy for the congestion he generates ; he maintains a constant level of utility. The non-switching transit rider incurs the same added congestion time cost caused by the switcher, but is not compensated. Equals are treated unequally." Segelhorst and Kirkus, 1973, pp 61 to 65.
- 324 Ibid p 63.
- 325 Ryall, 1968, p 38.
- 326 Bullock et al, 1968, p 262.
- 327 Fink, 1974, p 283.
- 328 For example see descriptions in :
- i) Akkoyunlu, E A, "A linear algorithm for computing the optimum university timetable," **Computer Journal**, Nov 1973, pp 347 to 350.
 - ii) Almond, Mary, "A University faculty timetable," **Computer Journal**, Aug 1969, pp 215 to 217.
 - iii) Bullock, M, Dickens, P, Steadman P, Taylor E and Tomlinson J. Series of articles in **Architectural Design**, May 1971, pp 292 to 305.

- 329 Carter, 1975, p 28.
- 330 For example :
- i) At Bath, Buchanan, 1965, p 56.
 - ii) At Southampton, Ryall, 1968, p 39. To aid public transport loads "may well require a drastic replanning of University teaching and office hours."
 - iii) At Manchester, as reported in Bullock et al, 1968, p 262. "The suggestion is also made that the introduction of staggered hours for starting in the morning, to avoid coinciding with the city centre peak period, could make any extra trips attractive to the (municipal) Transport Department and would ease traffic conditions on the road networks."
 - iv) At Stanford, as reported in Fink, p 289. "Studies should be initiated, with campus participation at both city and regional levels, to ascertain the potential that staggering of working hours has for reducing peak traffic demands."
 - v) Pinnell and Wacholder, 1968, p 20. "If the peak time of demand for campus users coincides with the peak created by business, an additional amount of congestion is created. This could be alleviated if campus class hours and campus office hours are shifted, with relation to local work hours, by some amount of time."
- 331 Davies, interview, 30 Jan 1975.
- 332 See Section 8.3 above.
- 333 Guyton J W and Reed G L, "Planning for campus traffic and parking, **Transportation Engineering Journal of ASCE**, Feb 1971, p 65.
- 334 Andrews et al, 1972, p 12.
- 335 Quillen M H and Yu J.C, "Management System for Campus Traffic Planning, **Transportation Engineering Journal of ASCE**, Nov 1972, pp 773 and 774.
- 336 Ibid, p 772.
- 337 Ibid, p 770. See also discussion in Carter, 1975, p 30.
- 338 Myles Wright, 1974, p 257.
- 339 Excerpt from Washington Board of Regents' minutes of 28 Sept 1973, quoted in Fink, 1974, p 293.
- 340 "Circulation modes within the campus shall be ordered according to the following priority : pedestrian, bicycle, transit, and automobile." Andrews et al, 1972, p 45.
- 341 Carter, 1975, p 16.
- 342 In the preceding Sub-section.
- 343 Pendakur V S and Sukumaran K. Discussion on "Planning for campus traffic and parking," **Transportation Engineering Journal of ASCE**, Nov 1971, p 718. "During a time when students are being represented in the University Senates, . . . this approach cannot be justified. Students who can afford to pay higher costs for higher levels of convenience should not be discriminated."
- 344 Reed G L. Closure on "Planning for campus traffic and parking," **Transportation Engineering Journal of ASCE**, Nov 1972, p 1067. "The writer suggests that an "opinion survey" . . . may help to formulate a system acceptable to the majority of campus users."

- 345 i) "Hitherto there has been a tacit assumption that the University, as an employer, is under an obligation to provide some form of car parking facilities for those members of its staff who need or wish to use cars to take them to their work." "University car parking problems and policy : Report of a Joint Committee of the Council of the Senate and of the Financial Board," **Cambridge University Reporter**, 1 Nov 1967, p 473.
- ii) "Parking for faculty and staff usually receives priority consideration based on the relatively high value placed on their time, and space is usually made available for them closest to the campus core, allowing for maximum convenience and mobility." Carter, 1975, p 20.
- 346 Guyton and Reed, 1971, p 79.
- 347 Quillem and Yu, 1972, p 775.
- 348 Maher M J and Birchall M C "A stochastic parking problem," **Traffic Engineering and Control**, May 1975, pp 220 to 223.
- 349 Kleberg J R "A look at college parking," **Parking**, Fall 1967, p 26.
- 350 Barr W G "Campus parking," **Parking**, Summer 1966.
- 351 **Vehicle parking arrangements**, University of Newcastle Upon Tyne, undated.
- 352 "Certain Departmental parking zones have been provided, and identified by numbered slots, the numbers corresponding to those on discs already issued to the Departments. No personal reservations are provided, but day-to-day rights to use a Departmental Zone will be determined by the Head of Department, in accordance with the need on any given day for a particular member of staff to use his vehicle in Manchester for Departmental purposes. Access to a Departmental Zone will only be obtainable on presentation to the attendant of the appropriate numbered disc ; these will be kept and issued to authorised users by Heads of Departments." University of Manchester Institute of Science and Technology (UMIST), **Revised Car Parking Regulations**, Oct 1974, paragraph 7.
- 353 Visit, 30 Jan 1975. (The pedestrian deck is called the "Parade," presumably an echo of eighteenth century Bath!)
- 354 Bullock et al, 1968, p xxxi.
- 355 "Pulling out of a parking jam," **College and University Business**, Nov 1970, pp 48 to 51.
- 356 Barr, 1966.
- 357 UMIST Regulations, 1974, paragraph 3, and Bourne, interview, 16 Jan 1975.
- 358 "Industry wheels into action to help campuses keep cars in their place," **College and University Business**, Nov 1970, p 53.
- 359 Ibid, p 53.
Also **Parking**, State University of New York, undated, pp 114 and 115.
- 360 The University of Newcastle and UMIST use these for the control of their surface lots.
- 361 Whitlock, E M "Use of linear programming to evaluate alternative parking sites." In *Parking Demand and Allocation*, **Highway Research Record No. 444**, Highway Research Board, 1973, pp 15 and 18.

- 362 **TRANSMAN : Urban Mass Transportation Administration Project**, Kent State University, 1972.
- 363 "When a bus approached a signal on the main street and the signal was green, the operator pushed a floor switch which transmitted a signal to a receiver assuring the bus additional time to pass through the intersection. When a bus approached a red light, the operator pushed the floor switch which activated the receiver, which caused the signal controller to return the green signal to main street as soon as it was safely possible to conclude side street green.
- The route which most nearly resembled a transit route in a larger urban area increased in average speed by 10 percent." **A Bus priority system for traffic signals : Urban Mass Transportation Administration Project**, Kent State University, 1972.
- 364 i) "Cambus : Transit at the U. of Iowa," **Metropolitan**, May/June 1973, pp 20 and 21.
 ii) McKelvey, D J, **Campus travel behaviour at the University of Iowa : a problem in applied transportation geography**, Institute of Urban and Regional Research, Iowa, 1972.
 iii) Wallace, Stephen, **The campus bus and peripheral parking system**, Office of Traffic and Parking, University of Iowa, 1972.
- 365 McKelvey, 1972, p 29.
- 366 "Cambus," **Metropolitan**, 1973, p 21.
- 367 Doxiadis, C A, "Cities in crisis and the university," **College and University Business**, Oct 1969, p 56.
- 368 Harland Bartholomew and Associates, **Ann Arbor Thoroughfare Plan**, University of Michigan, 1964. Quoted in Carter, 1975, p 12.
- 369 i) "Buses take the load off campus traffic," **College University Business**, Dec 1970, pp 54 to 56.
 ii) "Moving people on campus today and tomorrow," **College Management**, Aug 1971, pp 9 to 14.
 iii) Carter, 1975, pp 14 and 15.
- 370 Andrews et al, 1972, p 91.
- 371 i) Elias, S E G, **A feasibility study of an integrated City and University transportation system**, West Virginia University, Aug 1970.
 ii) "New transit schemes move toward construction," **Engineering News Record**, 17 Feb 1972, pp 10 and 11.
 iii) Elias, S E G: "Experience with the West Virginia University -- Morgantown Personal Rapid Transit System (PRT)." In **Symposium 73 : Advanced Transport Systems in British Cities**, Urban Transport Research Group, Warwick University/Lanchester Polytechnic, Coventry, 1973.
- 372 i) "Morgantown demonstration raises doubts on future PRT's," **Engineering News Record**, 29 Nov 1973, p 12.
 ii) "Doubts in US about viability of PRT," **New Civil Engineer**, 20 Dec 1973, p 16.
 iii) "Morgantown PRT may be scrapped," **Engineering News Record**, 18 April 1974, p 9.
 iv) "Morgantown boondoggle," **Engineering News Record**, 25 April 1974, p 68.
- 373 Letter dd 27 April 1978 to me from Public Relations Officer, Boeing Aerospace Company, Seattle.

- 374 "Fixed-rail rapid transit is headed for the campus," **College and University Business**, Dec 1970, p 50.
- 375 Villareal, Carlos, "The United States urban mass transit programme," **Traffic Engineering and Control**, May 1972, p 18.
- 376 Shand, **Report on findings**, 1977, p 3.
- 377 Fink agrees with the principle of combining Pendakur's "parking demand" causation factors with his own "travel orientation" factors -- he does it himself. Fink, 1975, p 20.
- 378 As Fink says of his own listing : "Not all of these five factors are equally important for each campus, nor do they all apply in establishing specific student transportation patterns. However, in one combination or another, they are the most significant factors in determining the transportation orientation of a campus." Fink, 1975, p 31.
- 379 Floor, B C, "Cost versus benefits," **Joint Conference on the Driessen Report**, Cape Town Chambers of Commerce and Industries, 1975, p 15.
- 380 Carter, 1975, p 11.
- 381 Ibid, p 16.
- 382 I do not wish to consider short-term (for the purposes of this discussion, daily or weekly or even monthly) fluctuations in demand. I wish only to consider a time span sufficiently long so that agreed changes in policy may be effected. "Medium-term" in this context means a year, time for a programme of, say, bus improvement and parking tariff changes to be introduced, given a fair trial, and assessed.
- 383 "In the future, land space (for buildings) may become critical. On some campuses, land is unavailable ; on others, it may become prohibitive because of cost. On these campuses, expansion is almost impossible except on university property of lower priority -- possibly present parking lots." Carter, 1975, p 10.
- 384 I in my 1971 thesis derived a number of interesting but useless mathematical relationships between such factors as parking supply and demand. Wall, 1971, p 62.
- 385 Guyton and Upchurch, 1975, p 17.
- 386 See Sub-section 8.4.2 above for additional remarks on "overall data averages."
- 387 This concern has also been expressed of CBD transportation studies. As a typical example, Pearman and Button criticise Lesley's attempt "to try to devise (and justify) numerical criteria for optimising urban public transport," referring to it as "symptomatic of the increasing use made of statistical program packages in quantitative investigation." Pearman A D and Button, K J "The analysis of urban public transport : some comments and suggestions," **Traffic Engineering and Control**, July 1973, pp 132 and 133. Commenting on Lesley, L J S, "A parametric analysis of European public transport," **Traffic Engineering and Control**, March 1971; pp 584 to 587. See also Lesley's letter to me, dd 1 June 1971.
- 388 There is the further possibility that a solution was wrongly derived, and was inappropriate under **any** circumstances. I trust that this possibility is an unlikely one.
- 389 For "models," read "solutions." Pearman and Button, 1973, p 133. For a related comment, see Floor (reference 379) above.

- 390 For example : "Increasingly, however, in transportation planning there is recognition of the significance of modal interdependencies." Pearman and Button, 1973, p 133.
- 391 Pendakur, "Urban universities," p 360.
- 392 Shands, **Project report**, 1975, pp 39 and 40.
- 393 Thomas, Edwin and Schofer, Joseph, "Strategies for the evaluation of alternative transportation plans," **National Co-operative Highway Research Program Report 96**, Highway Research Board, 1970.
- 394 Shands, **Project report**, 1975, p 40.
- 395 Organisation for Economic Co-operation and Development, "The urban transportation planning process." **Report of the Board**, 1971, p 16.
- 396 Rees, 1973, p 3.2.05. See also my remarks in Chapter 1.
- 397 Wachs, Martin, Hudson, Barclay and Schofer, Joseph, "Integrating localised and system-wide objectives in transportation planning," **Traffic Quarterly**, April 1974, p 167.
- 398 Floor in Section 10.2, reference 379. Pearman and Button in Section 11.1, reference 389.
- 399 Carter, 1975, p 30. See also *ibid*, pp 22 to 27 and 30 to 32.
- 400 Shands, **Project report**, 1975, pp 42 and 43.
- 401 See : Lindblom, C E, "The science of muddling through." In **A reader in planning theory** (ed A Fauldi), Pergamon Press, 1973, pp 151 to 169, on sub-optimising techniques.
- 402 As defined in reference 383.
- 403 For the purposes of this discussion, define "long-term" as the minimum time to plan, construct and bring into service a building such as a multi-level parking structure.
- 404 See especially the references to UND's Shepstone Building in Sub-section 7.10.2 above.
- 405 Sub-section 9.4.2 turned out to be the most useful portion of the whole research as far as policy guidance is concerned.
- 406 Tindal, quoted in Sub-section 9.3.2 above.
- 407 One mile, at 80 metres/minute. From Fink, quoted in Sub-section 9.4.2 above.
- 408 As suggested by Williman in Sub-section 9.3.2 above.
- 409 Carter has the following comments. "If housing on or near campus is to reduce parking space requirements effectively, it should be co-ordinated with a policy of limited car use on campus for those living within walking distance of the university." Carter, 1975, p 28.
- 410 A pedestrian desire line diagram will assist this.
- 411 For example, the implication of re-routing Rhodes Drive beneath the University rugby fields, which was estimated in 1974 to cost over R5 m, has occupied the attention of

- UCT and the municipality of Cape Town for many years without making progress towards any commitment to construction. Ninham Shand and Partners, **UCT – Report on scheme for Rhodes Drive**, June 1974.
- 412 Quoted in Sub-section 9.4.3 above.
- 413 "The Committee supports in principle the introduction of staggered working hours schemes." Note Driessen's clear exposition of the advantages and disadvantages of such schemes. Driessen, pp 33 and 34.
- 414 Carter, 1975, p 9.
- 415 Shands suggest, as a possibility, "a demand-responsive form of mini-bus service," Shand, 1975, **Project report**, p 23. Car pools, properly organised, could have nearly all the advantages of such a service, at negligible cost to the university.
- 416 Carter, 1975, p 10.
- 417 Carter, 1975, p 10.
- 418 The argument has often been advanced, when solutions to campus transportation problems are discussed, that a free bus service would make a substantial contribution by persuading many commuters to leave their cars at home. The UCT data clearly demonstrate that this is not true. Shand, 1977, p 52 – "over 80 percent of the bus users have no other means of transport," and "the fare-free bus service . . . (has had only) limited success in attracting potential car drivers."
- 419 "... parking capacity (acts) as a control of the number of vehicles arriving at the accesses and moving on the internal road system." Shand, **Report on findings**, 1977, p.25.
- 420 See also Sub-section 9.4.2 above, paragraph v.
- 421 See Sub-section 8.4.2 above for reasons why UCT 1980 predictions of demand have not been realised.
- 422 See Sub-section 9.4.6 above.
- 423 Pools for each Department, and Department head allocates spaces on a daily need basis.
- 424 See Sub-section 9.4.6 above, paragraph vii.
- 425 Carter, 1975, p 13.
- 426 Sub-section 9.2.4 above.
- 427 Carter, 1975, p 20.
- 428 Ibid, p 21.
- 429 Ibid, p 21.
- 430 For a rigorous discussion of this issue, see Cambridge, 1967, pp 474 and 475 ("And yet there must be a doubt as to whether the provision of car parking facilities, at any rate free facilities, can ever catch up with demand -- does it not rather act as a spur to greater use of the motorcar and therefore to continuous and insatiable increases in demand?), and pp 489 to 494 ("The University should accept the principle that, from a given date, the capital costs of providing additional car parking spaces and the annual costs of renting,

supervising, and maintaining all car parking facilities should be recovered by a system of charges and should not be met from ordinary University funds."

- 431 Carter, 1975, p 21.
- 432 Ibid, p 22.
- 433 Ibid, p 22.
- 434 "Planning should proceed on a dynamic basis and should be capable of responding to change and unforeseen events. Good information systems are the key to achieving this flexibility." Shand, **Project report**, 1975, p 23.
- 435 Carter, 1975, p 11.
- 436 See also ibid, p 12.
- 437 See also ibid, pp 12 and 13.
- 438 Nor could West Virginia, but Morgantown was funded as a CBD demonstration project!
- 439 Why UCT only? Because –
 – it is one of the most, if not the most, advanced thinkers and practitioners of transportation planning in RSA; and
 – I have, thanks to interviews and a literature survey, a more comprehensive understanding of UCT's thinking than I have of any other RSA campus.
- 440 UCT **Analytical studies**, 1971, p 6/12.
- 441 Unfortunately, no-one in RSA is the pioneer in the practical application. See Section 8.3.
- 442 UCT **Analytical studies**, 1971, p 2/6.
- 443 Shand, **Interim report on policy options**, 1976, pp 4,5 A12 and A15.
- 444 See proposals in Shand, **Report on findings**, 1977, pp 53 to 56, 73 and 74.
- 445 Ibid, p 25 and pp 31 to 34.
- 446 Ibid, pp 26 to 28.
- 447 Ibid, pp 34 and 73.
- 448 Ibid, pp 43 and 44.
- 449 Interview with Prof J D Hampton, 15 Feb 1978.
- 450 "We feel that financial disincentives to parking on the campus are the only practicable measures available to ensure that cars are not brought onto the campus except for good cause." Letter dd 27 August 1975, from the Chairman, Staff Association, to the Traffic Committee.
- 451 Shand, **Report on findings**, 1977, pp 72 and 73.
- 452 Ibid, pp 57, 74 and 75.
- 453 Pendakur, "Canadian universities," 1968, p 536.

- 454 For example, Shand, **Report on findings**, 1977, pp 29 to 32.
- 455 Carter, 1975, pp 18 to 20.
- 456 The phrase is from UFRC, 1961, p 18.
- 457 Wilbur Smith and Associates, **Parking in the city centre**, 1965, p 36.
- 458 The standard text on the subject of parking economics is Richard C Rich, **Parking economics and design**, Richard C Rich and Associates, Detroit, 1968.
- 459 See Section 7.12 above.
- 460 Guyton and Reed, 1971, p 80.
- 461 See Sub-section 9.4.6 above, last paragraph.
- 462 While there may be a possibility, following Driessen thinking, of money at some future time being made available for this purpose, in the present economic circumstances it, along with other Driessen implementation proposals, enjoys little prospect of realisation.
- 463 See Australian National suggestion in Sub-section 9.2.3 above.
- 464 As UMIST ; see Sub-section 9.4.6 above.
- 465 For a rigorous discussion, see Cambridge, 1967, pp 489 to 491.
- 466 Keefer and Witheford, 1969.
- 467 For example, Ninham Shand and Partners, **Groote Schuur new hospital – traffic and parking study – survey report**, 1974.
- 468 For example :
- i) Pendakur, V Setty, and Roer, Paul, **Access and parking criteria for hospitals**, School of Community and Regional Planning, University of British Columbia, 1970.
 - ii) Claire, W H, and Johnson, R A P, "Planning for Memphis Medical Centre traffic and parking," **Transportation Engineering Journal** of ASCE, Feb 1971, pp 51 to 62.
 - iii) Davies, E M, "Prediction of traffic and parking load for a teaching hospital site," **Traffic Engineering and Control**, May 1975, pp 224 to 226.

APPENDIX A

PRIORITY STATEMENT PRIORITY RANKING : COVERING LETTERS

C8 Lancaster House
Three Anchor Bay
Cape Town
8001

1977-10-22

The Registrar

Dear Sir

STUDY OF UNIVERSITY TRANSPORTATION

I propose, later this year, to send a questionnaire round to every South African university, asking them to provide me with selected information in respect of the transportation characteristics of the students and staff who commute to their teaching campuses every day. An analysis of this information, which I will write for my MSc thesis at UCT, will of course be made available to every respondent.

In order to guide me with my compilation of this questionnaire, I would appreciate it if you could assess the attached list (see "Annexure") of statements of possible research fields, in the light of your own interests and needs. Please give a high priority rating to information which you would regard as potentially useful to you, were you able to compare your standing in respect of that information to the standing of all other universities. Then post the Annexure back to me (stamped self-addressed envelope provided.)

May I ask if you are prepared, when my later questionnaire comes round, to give me the required information as applicable to your university?

If you think I am being too ambitious, please don't hesitate to say so!

Thanking you in anticipation

Yours faithfully

KEVIN WALL Pr. Eng.

C8 Lancaster House
Three Anchor Bay
Cape Town
8001

1977-10-22

Die Registrateur

Meneer

I.S. UNIVERSITEIT VERVOERSTUDIE

Vir my MSc graad aan U.K., beplan ek om later die jaar 'n vraelys aan elke Suid-Afrikaanse universiteit te stuur vir spesifieke inligting i.v.m. die daaglikse vervoerpatroon van personeel en studente tussen hulle verblyfplek en die universiteit.

Om my met die samestelling van hierdie vraelys te help, sal ek dit waardeur indien u die aangehegte vorm ("Annexure"), met verklarings van moontlike navorsingsvelde, sal evalueer in die lig van die universiteit se eie belangstelling om behoeftes. Gee asseblief 'n toekennning in rangorde van belangrikheid t.o.v. die universiteit. Vir hierdie vorm word 'n gefrankeerde koevert ingesluit.

'n Analise van hierdie inligting sal aan die universiteit beskikbaar gestel word. Hierdie analise sal dit moontlik maak om die universiteit se posisie t.o.v. die ander universiteite te bepaal.

Mag ek so voorbarig wees om my latere vraelys vir spesifieke inligting van die universiteit aan u te stuur vir beantwoording?

By voorbaat dank.

Die uwe

KEVIN WALL Pr. Ing.

ANNEXURE *

Project statement priority ranking

This questionnaire has a simple purpose. It aims to provide me with a simple quantitative method of reflecting the actual needs of the universities in the setting of priorities for my potential research projects.

To complete the questionnaire you need only enter a number from 0 to 10 in the appropriate box next to each project statement.

The numbers in the boxes under column A must reflect the importance you attach to each particular project. Zero would indicate that the information resulting from the project would not be of any use to you; ten would indicate that the information would be of great importance to the continued viability of the campus.

The numbers in the boxes under column B must reflect the urgency you attach to each particular project. Zero would indicate that the information resulting from the project would be of use only in the very long term, if at all; ten would indicate that the information would be of immediate use in your campus planning.

To simplify processing, I have placed all answer boxes on a single sheet. Please complete this sheet and return it to me in the stamped self-addressed envelope within a day or two. Your response will only require a few minutes of your valuable time, and will directly influence many hours of research effort.

I am anxious to receive your thoughts on what research is most warranted. If you have a problem area that is of concern to you, and it is not on the list, please describe it in slot 19 (and beyond, if necessary).

Many thanks

K WALL

Your university

Your name

Your designation

| | A | B |
|---|---|---|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |

| | A | B |
|----|---|---|
| 10 | | |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | | |
| 15 | | |
| 16 | | |
| 17 | | |
| 18 | | |

QUESTIONNAIRE AND COVERING LETTERS

C8 Lancaster House
Three Anchor Bay
Cape Town 8001

1978-01-20

The Registrar

FOR ATTENTION :

Dear Sir

STUDY OF UNIVERSITY TRANSPORTATION

You will recall that in October last year I sent a questionnaire round to your university. This questionnaire asked you please to assess a series of statements of possible research fields, all to do with the transportation characteristics of the students and staff who commute to your teaching campus every day, in the light of your own interests and needs.

I am pleased to report that a good response was received; thank you once again for your help.

As a result, I have been able to compile my second and final questionnaire. This questionnaire seeks the facts and figures which will hopefully enable me to discover the correlations which the majority of respondents kindly indicated, in their reply to my first questionnaire, would be of most value to them. I have in addition much information on overseas trends and policies. The result of my researches will of course be made available to you. Hopefully it will be of value to your university's transportation planners.

Hence I would be very grateful if you were to arrange for the completion of this questionnaire and its return to me at your convenience. It is not desirable that the figure data be given exactly; close approximations would be appreciated.

If/....

I must stress that, while I am fishing for as much information as possible, I do not want you to do a single measurement on my behalf. Please just give me what you have to hand, and leave the rest blank.

If you think I am being too ambitious, please don't hesitate to say so!

Can I ask for a return by the end of February?

Thanking you in anticipation.

Yours faithfully

KEVIN WALL Pr. Eng.

C8 Lancaster House
Three Anchor Bay
Cape Town 8001

1978-01-20

Die Registrateur

VIR AANDAG :

Meneer,

I.S. UNIVERSITEIT VERVOERSTUDIE

Ek verwys na die vraelys wat ek gedurende Oktober 1977 aan u universiteit gestuur het. Die doel daarvan was om sekere aangeleenthede in verband met daaglikse vervoer van studente en personeel na en vanaf die hoofkampus te ondersoek en wordgedoen in belang van almal wat daarby betrokke is.

Ek is bly dat ek kan sê die reaksie op bogenoende was baie goed. Weereens baie dankie vir die hulp in hierdie verband.

Die inligting wat ek ingewin het, het dit vir my moontlik gemaak om die tweede en dan ook laaste vraelys op te stel. In hierdie vraelys verlang ek feite en syfers wat my hopelik sal help om die verwantskap tussen gegewens wat u in die eerste vraelys ingevul het, te ondersoek en te ontleed. Die resultate van my ondersoek sal aan u bekend gemaak word en hopelik sal dit vir u van nut wees in soverre dit vervoer aangaan.

Ek sal dit baie waardeer indien u die voltooiing en terugstuur van hierdie vraelys kan reël. Dit is nie nodig dat absoluut korrekte syfers en data weergegee word nie; skattings sal voldoende wees.

Ek wil dit duidelik stel dat alhoewel ek soveel inligting moontlik probeer bekom, verwag ek nie dat enige uitsonderlike moeite om my onthalwe gedoen moet word nie. Inligting wat byderhand is sal voldoende wees, en die res kan blanko gelaat word.

As/.....

As u beskik oor ander inligting van watter aard ook al (verslae, lysste van gegewens, ens.) wat dié in die vraelys verlang, geheel of gedeeltelik kan vervang of aanvul, sal ek graag die koste wil dra om afskrifte van sodanige inligting te bekom.

As my versoek na u mening buitensporig is, moet asseblief nie weier om dit so aan my te stel nie!

Ek sal dit hoog op prys stel as die vraelyste teen die einde van Februarie 1978 teruggestuur kan word.

Ek vra verskoning vir die feit dat die vraelys nie in Afrikaans is nie - dit is slegs om administratiewe redes in Engels saamgestel.

By voorbaat dank

Die uwe

KEVIN WALL Pr. Eng.

STUDY OF UNIVERSITY TRANSPORTATION

Research for MSc thesis, Department of Civil Engineering,
University of Cape Town.

Please complete and return to Kevin Wall, C8 Lancaster
House, Three Anchor Bay, Cape Town 8001.

(Please note that the information is requested for the
year 1977. Should this information not be available
for 1977, please state to which year the given informa-
tion is applicable.)

Your university

Your name

Your designation

1.0 LOCATION

1.1 How many campuses? (Ignore those contributing
less than 5% of students): Please tick appro-
priate category.
One only One large, one small Two same
size Other (specify)

(Please answer remainder of questionnaire in
respect of the main campus only.)

1.2 Year the University commenced occupation of the
campus in question:

1.3 In what sort of area? (tick)
Commercial Industrial Residential
Undeveloped Other (specify)

1.4 Distance of campus from city centre: Less than
1 km 2 km 5 km 10 km More than
10 km
(If you have any brochure which, even incidentally,
describes the University's location in more detail,
please send me a copy.)

2.0 POPULATION

2.1 How is the University population on the main cam-
pus made up? (Please round answers to nearest hun-
dreds) Note that "off-campus" residents will in-
clude some students in official University housing,
if this is not all located on the main campus.

Full/....

| | Campus residents | Living off-campus | Total |
|-----------------------------|------------------|-------------------|-------|
| Full-time students | | | |
| Academic and clerical staff | | | |
| Cleaners, messengers, etc. | | | |
| TOTAL | | | |

2.2 Enrolment trends in past few years - average increase per cent per annum:

3.0 TRANSPORT

3.1 Opinion Survey

How well would you say the campus was served in respect of:- (tick)

| | Over-provided | Adequate | Inadequate | Very Inadequate |
|---------------------------|---------------|----------|------------|-----------------|
| Road access to the campus | | | | |
| Public transport | | | | |
| Parking facilities | | | | |

3.2 Planning

To what extent has your university agreed on a transportation planning policy for, and prepared a transportation plan of your main campus? What are the objectives of these policies and plans? (Answers on separate sheet please.)

3.3 Modal Split

3.3.1 What year was a modal split survey last done?
 Was it for a peak time or for the whole day? (the latter would be more useful)

What/.....

What were its results? (preferably express as number of persons):-

| Mode | Students | Staff | Total |
|--------------------|----------|-------|-------|
| Car | | | |
| Motorcycle | | | |
| Pedal Cycle | | | |
| Bus | | | |
| Train | | | |
| Walk | | | |
| Resident on campus | | | |
| TOTAL | | | |

3.3.2 How, if at all, do you think this split has altered since the above survey was carried out? -

3.4 Public Transport

3.4.1 Is there a frequent railroad (surface or subway) service passing close to the campus and serving it: (tick)
 Yes Infrequent None at all?

How far away is the nearest station from the centre of the campus km?

3.4.2 Is there a bus service directly onto the campus: (tick)
 Yes No? How many buses enter leave the campus every weekday? Where do the buses terminate:
 Central business district Railroad station
 Other (specify)? Do the buses during the peak time run: full
 3/4 full 1/2 full? Are fares charged:
 Yes No? Are they fully economic
 Or subsidized?

3.4.3/.....

3.4.3 Is there a frequent bus service passing close to the campus and serving it: Yes Infrequent None at all? How far away from the centre of the campus is the nearest stop:?

3.5 Car transport

3.5.1 Is there any through motor traffic across the campus (i.e. traffic which does not stop there, not even to drop someone off): Yes Negligible? What proportion is it of peak traffic 3/4 1/2 1/4 1/8

3.5.2 Are parking fees charged or discs issued to restrict the entry of or parking of cars belonging to any category of persons to or on the campus? (State details, including charges) Are there any other restrictions on car ownership or usage or parking availability (state)? (Please answer this in fair detail) Please append copies of any traffic regulations applied to the campus population.

.....
.....
.....
.....
.....
.....
.....
.....

3.5.3 Could you please attach some sort of map or aerial photograph of the campus showing roads, the major centres of student activity and kerb-side and off-street parking areas with very approximate capacities. For off-street, distinguish between parking lots and parking structures (i.e. more than one level, roof top, basement - state which, and how many levels in all.)

3.5.4 Thus parking demand and supply at peak time, which is a.m./p.m.:-

(Insert figures)

| | | | |
|---|---|---------------|-------|
| Approx. no. spaces available | } | Students only | _____ |
| | | Staff only | _____ |
| | | Mixed | _____ |
| | | Other | _____ |
| | | Total | _____ |
| Less vacancies | | Minus | _____ |
| Plus illegal parkers | | Plus | _____ |
| Peak accumulation of cars on the campus | | Equals | _____ |

3.5.5 Please give the total number of cars parked on the campus, at intervals (hourly, if available) through the day.

| | | | | | | | | | | |
|------|--|--|--|--|--|--|--|--|--|--|
| Time | | | | | | | | | | |
| Cars | | | | | | | | | | |

3.5.6 How many student and staff cars, do you estimate, are parked on public roads at peak time?

.....

3.5.6 How many cars are owned by: Students Staff? Do you have any comparable data for previous years (please append)?

3.6 Miscellaneous

3.6.1 Would you say appreciable traffic congestion occurs on approaches to University: Yes No? If yes, state nature and time of duration and of occurrence:

.....
.....
.....
.....
.....

Within University: Yes No? If yes, state nature and time of duration and of occurrence:

.....
.....
.....
.....
.....

3.6.2 How many traffic officers are permanently stationed on the campus:? Do they have the power to impose fines: Yes No?

3.6.3/.....

3.6.3 Has deliberate staggering of starting times of lectures been resorted to yet (tick) :
 Not at all On small scale On large scale? What is the starting time for first lecturea.m.? Can I assume that lectures follow the usual pattern (for RSA universities) of 75% (or more) completion by lunchtime? (only full-time students are referred to) Yes No?

4.0 Future

4.1 What can you tell me of the University's plans to control transport on the campus in the next few years? Do they include any of the following possibilities:- (tick)

- 4.1.1 Restriction of permission to use or own cars to a particular portion of the campus population
- 4.1.2 Imposition of or increasing of parking fees
- 4.1.3 Removal of privileges (eg. parking bays reserved for individuals)
- 4.1.4 Construction of more parking lots
- 4.1.5 Provision of a single floor or part thereof of parking in new faculty buildings
- 4.1.6 Erection of multilevel parking structure(s)
- 4.1.7 Deliberate restriction of growth of academic activity on the campus
- 4.1.8 Appointment of more traffic officers
- 4.1.9 Alteration of road layout
- 4.1.10 Staggering starting times of lectures on a larger scale
- 4.1.11 Undertaking of traffic study in the near future
- 4.1.12 Other (specify)

| | Yes | No |
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*4.2/.....

*4.2 If yes to 4.1.1, 4.1.2, 4.1.3, 4.1.4 or 4.1.10, please give detail on separate sheet.

4.3 Have you anticipated the student and staff reaction to 4.2 above? Have you surveyed opinion? How will those affected react? Please give detail on separate sheet.

5.0 Other References

Would you suggest that I could with benefit contact your consulting engineers or architects or any other authority for further information on or background to the above topics:

Yes No.....?

Please name the consultants/authority:.....
.....