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IMPACT OF URBAN GROWTH
ON THE PROVISION OF MUNICIPAL SERVICES

A CASE STUDY OF THE TOWNSHIP OF GLOUCESTER

BY

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Submitted to the School of Graduate Studies
in Partial Fulfillment of the
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Sucheta Kapuria

University of Ottawa,

Ottawa.

October, 1978.

ABSTRACT

The research studied the impact of urban growth on the provision of municipal services. The Township of Gloucester was selected as a case study as it is one of the fastest growing municipalities in Canada.

Population, revenue, number of housing units, number of commercial and industrial establishments, and urban road mileage were taken as the determinants of urban spatial growth. The expenditure on different municipal services was analyzed as a result of residential, commercial and industrial growth. The statistical techniques of Indexed Trend Analysis and Time Series Multiple Regression Analysis were adopted for predicting the trend. The results indicated that there is a high correlation between urban spatial growth and the expenditure on municipal services. As the amount of growth increases with the time, the cost of providing different municipal services also increases. In comparison to commercial and industrial growth, the residential growth is more expensive as it generates less income and demands more services.

RESUME

Cette recherche étudie l'impact de la croissance urbaine spatiale sur l'approvisionnement des services municipaux. On a choisi le canton de Gloucester comme cas-exemple parce qu'il figure parmi les municipalités canadiennes qui ont eu une croissance rapide de leur population.

La population, les revenus, le nombre de maisons, le nombre d'établissements commerciaux et industriels, et la longueur de voirie urbaine sont utilisés comme variables déterminantes de la croissance urbaine. Les dépenses pour des services municipaux sont analysées comme résultant du processus de croissance résidentielle, commerciale, et industrielle. L'"Indexed Trend Analysis" et la régressions multiple sont utilisées comme méthodes statistiques. On montre qu'il y a une corrélation entre la croissance urbaine et les dépenses pour les services municipaux. La source la plus importante de l'accroissement des dépenses municipales est la croissance résidentielle.

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CHAPTER 1

INTRODUCTION

1.1 PERSPECTIVE:

Like other urban places around the world, the Ottawa-Hull area is also facing the problem of growth. Jacques Gréber, in his Plan in 1950 estimated that the population of the National Capital Region would be 500,000 by 1980 [1]. This threshold was reached by 1966 [2], and also according to a recent publication of the National Capital Commission (N.C.C.), this trend in population growth is most likely to continue as stated below:

> "It appears likely therefore that the Region's population will reach 1.3 to 1.4 million by the end of this century. The main relevance of this figure is not an objective so much as a probability. In terms of regional planning, it would establish the level to which responsible, prudent planning must foresee possible requirements for public services and amenities." [3]

As a result of this urban growth, the development of remedial as well as preventive public policies has become increasingly difficult due to several factors such as:

1. The ethic of growth in North America is being increasingly challenged as it is no longer accepted unquestionably as a premise of progress; [4]
2. The lack of understanding which relates to the complex interplay of many macro and micro level forces which continually influence urban growth and development; [5]
3. The different views on how to guide future growth, held by the two regional municipalities (Ottawa-Carleton and Hull) due to their respective varying stages of development and priorities; [6]

4. The presence of a unique feature, the seat of the Canadian Federal Government which when added to ordinary provincial-municipal relations give rise to a problem of inter-governmental arrangements so formidable indeed that one wonders if it can be solved at all. [7]

Aside from these factors and in light of the history of similar urban growth in other parts of Canada and elsewhere, all levels of governments do agree, however, on the fact that only farsighted planning can prevent the usual problems which accompany urbanization: such as over-crowding, traffic congestion, erosion of existing communities and pollution of the environment.

So far much energy has been spent on the production of different types of plans, drawn at various scales and by different authorities. Most of these plans, however, depart little from the traditional city planning process, in that they show a strong emphasis on the very general and long range future planning while minimizing the specific and the immediate requirements. [8] In addition, due to their internal discrepancies [9], they often prove almost useless in directing the future growth of an area. Therefore modern concepts such as continuous city planning, managed growth [10], and urban growth management through development timing [11], are being proposed as endeavours which should prove more efficient and useful to planners, officials, citizens, attorneys, and others throughout the country whose communities are concerned about the issues involved in the management of growth. Some of these authors maintain that while many localities have long utilized zoning and other land use regulations in their jurisdictions, the recognition of the necessity to guide growth affirmatively in an integrated and systematic manner is of more recent vintage.

It is thus imperative to study the real impact which planning is exerting on the growth of our localities while also paying attention to the nature, the direction and various other problems associated with the planning process underlying growth at the regional and local level.

1.2 NEED FOR THE STUDY:

Although planning is not a new phenomenon in the Ottawa region, it is evident that the increasing concern of various jurisdictions to become more active in the directing of their future growth is likely to serve as an increasing source of conflict within and among areas.

So far, most of the literature pertaining to urban problems has consisted in surveying the many issues which urban places of various kinds have been confronting at different time intervals and at varying stages of the growth process. Until the past several years, the economic benefits of urban growth were largely unquestioned. Only in the recent past did communities begin to take a penetrating look at urbanization and its consequences.

Among the important consequences of urban growth that are attracting attention are its fiscal impacts. Will a proposed private development - or a series of them - enhance government revenues or constitute a net drain? Local governments in particular are questioning whether new growth will expand their treasuries or deplete them, throwing new tax burdens on existing residents.

This concern with fiscal effects is typically expressed in terms of dollar surpluses or deficits, but the issue goes well beyond an accounting problem. The future of public services provision perhaps lies at the heart of the matter. Will new developments force local

governments to pull in their belts and reduce the quantity or quality of services. Or will the new homes, businesses, and industries proposed generate net revenue that can be used to expand the parts and transportation networks and to improve schooling, fire protection, trash collection, public safety, and other municipal services that residents and businesses desire? A considerable number of recent studies address these questions and no one would deny the importance of studying such a problem.

1.3 STATEMENT OF THE PROBLEM:

The purpose of this study is to find out the effects of urban spatial growth on the provision of municipal services so that it could serve as a valuable aid in co-ordinated planning and land use decisions for the local governments, planners and citizens who are wrestling with problems of urban growth. In order to have a better understanding of the problem, the whole study has been divided in several chapters - the first introducing and explaining the problem; the second discussing the urban growth; the third dealing with municipal services and municipal finances; the fourth outlining the methodology; the fifth dealing with data interpretation and analysis and finally the conclusion.

1.4 LIMITATIONS OF THE STUDY:

Due to the complexity of the region involved, this study will be limited to a portion of a single geographical area of the Regional Municipality of Ottawa-Carleton, that of the urban part of the Township of Gloucester. This Township has been selected as a case study because it is one of the most rapidly growing townships in Canada.

The Township of Gloucester, incorporated in 1850, is the third most populous municipality in the region, after the City of Ottawa and Nepean

FIGURE - 1

RMOC AND THE TOWNSHIP OF GLOUCESTER

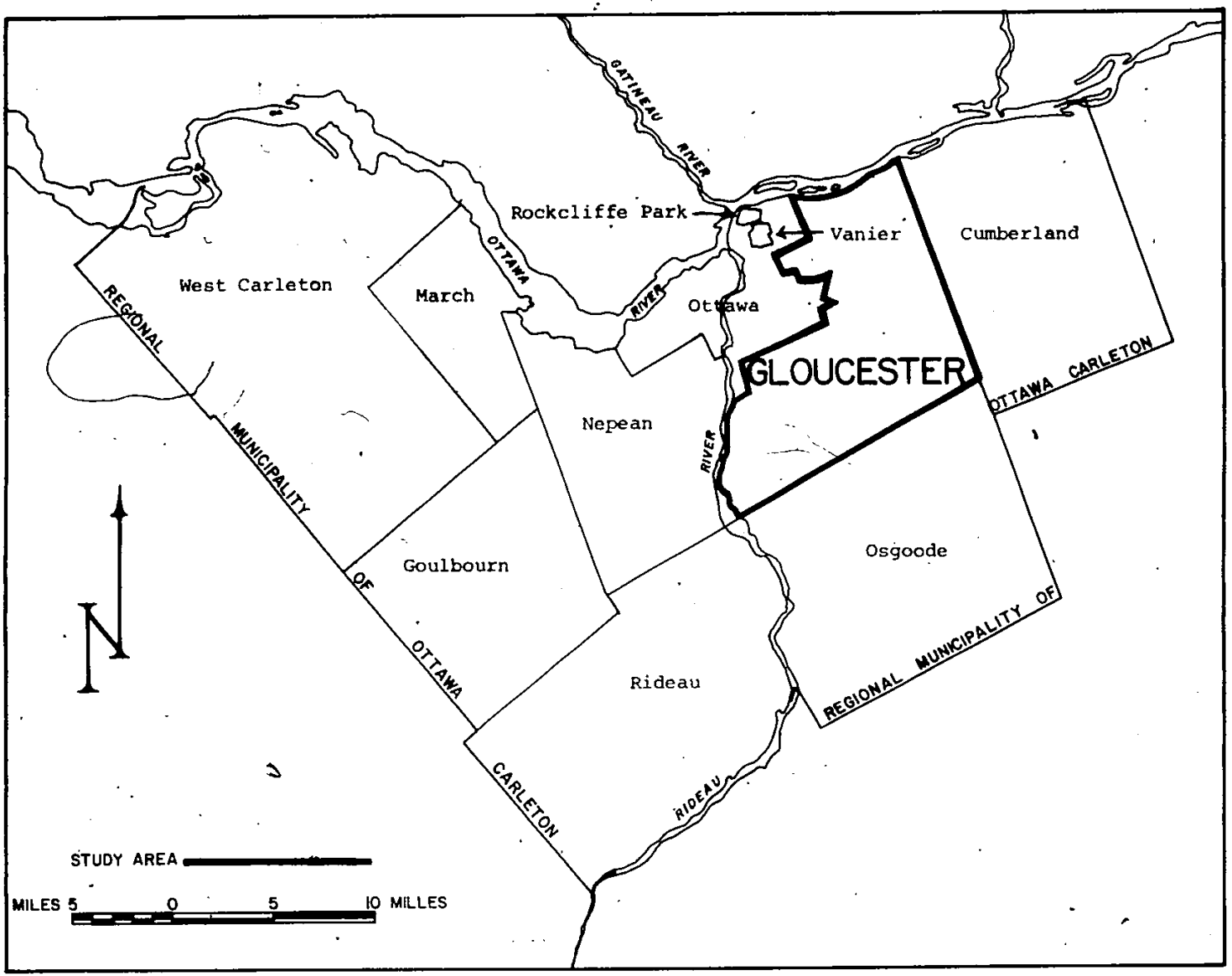
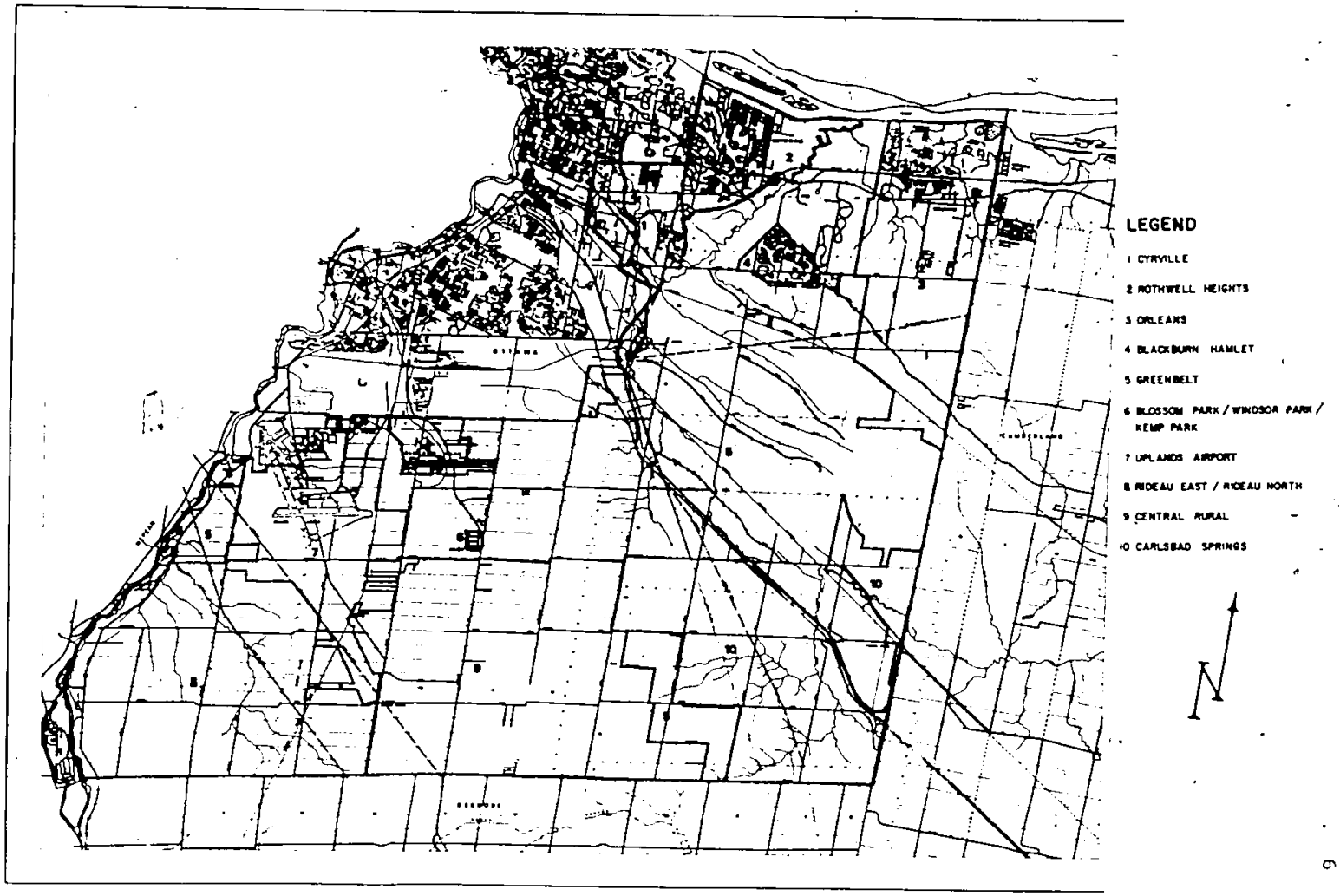


FIGURE 2

TOWNSHIP OF GLOUCESTER



Township. In the past decade, Gloucester has undergone a major transition, as new housing developments have more than doubled the population. The main population centres are Orleans, Blackburn Hamlet and Leitrim, though much of the area adjacent to the City of Ottawa is highly built up. The location of the Township of Gloucester in the context of the Ottawa-Carleton Region (referred to as Region), is shown on the attached maps (Figures 1 and 2).

The cost to the Township of Gloucester, of providing various municipal services can readily be determined. The local sources from which revenues are generated to pay for these services are equally obtainable. By extracting detailed information on taxable assessments, it is also possible to present precise information on the tax revenues yielded by particular properties, individually or by class.

It is much more difficult to calculate the cost of furnishing each property or each class of property with the services that are directed to its benefit. In part, the problem results from the fact that municipalities have not set about to develop cost accounting with respect to various services. For example, municipalities like Gloucester could apportion the cost of road maintenance among roads serving the farms, roads serving industrial areas, roads serving urban residential areas, and so forth. Such a breakdown would of course have to apportion the cost of roads that serve more than one form of development, for example residential and commercial properties in the urban areas. But municipalities have not broken down their road expenditures in this manner. Therefore, the relative amounts spent to maintain local road systems within rural areas and urban areas of differing types can only be estimated, using the help of those responsible for providing the

services and any pertinent estimates of cost that have been developed in other places. This approach is made more difficult by the fact that services are not uniform in either performance or cost from one municipality to another. Experience gained, for example, from the Township of Goulburn cannot be expected to be equally applicable to the Township of Gloucester.

Another serious obstacle to precise cost benefit analysis results from the fact that the extent to which a particular service is considered to be of benefit to each specified taxpayer or groups of taxpayers is far from clear: allocation of benefits is a matter of opinion and a subject of some controversy.

For the above reasons, cost benefit positions presented in this study cannot be expressed as dollars and cents comparisons. They must take form of considered opinions as to the relative advantages of some form of urban development over another derived through extensive fact gathering and interviewing in Gloucester supplemented by information and opinion obtained elsewhere. What we shall endeavour to do is to present as clear and orderly a statement as possible of the probable financial consequences flowing from different forms of urban spatial growth. Such consequences will be related to the existing range and extent of municipal services in Gloucester and their present form of financing but will take note of changes in available services or the method of payment for such services that might realistically be considered.

Under Ontario law, municipalities are required to tax real estate in a particular way. Taxable assessments are supposed to represent the same portion of present market value in the case of each assessed

property. With assessed values in Gloucester amounting on the average to an estimated 18.5 percent of market value, and with the primitive methods of assessment that have been applied in the past and still apply, there are bound to be widespread departures from the uniform value relationships that are supposed to exist both between classes of properties and from one property to another within the same class. While we have some acquaintance with the distortions to be found within the Ottawa-Carleton Assessment Region, it has not been possible to make any allowance for them in this analysis.

As it has already been stated that in the recent past, there has been a very rapid and explosive growth in the Township of Gloucester. We have tried to gather all the necessary information required for this study from different sources. But in many instances, sufficient data were not available. In those cases, certain assumptions and projections have been made based on previous trends or on the basis of other relevant information.

FOOTNOTES

1. Gréber, Jacques: "Plan for the National Capital: Canada General Report", Ottawa, Queen's Printer (1950).
2. Tomorrow's Capital: Invitation to Dialogue. Ottawa: The National Capital Commission, 1974, pp. 91.
3. Tomorrow's Capital: op. cit. pp. 10.
4. R.W. Scott, D.J. Brower and D.D. Miller - Management and Control of Growth: Issues, Technigues, Problems, Trends. Washington, D.C. The Urban Land Institute 1975, pp. 589.
5. S. Gale and E.G. Moore (eds.) The Manipulated City: Perspectives on Spatial Structure and Social Issues in Urban America. Chicago: Maaroufa Press, 1975, pp. 366.
6. Tomorrow's Capital: op. cit., pp. 12.
7. H.B. Mayo: Report of the Ottawa-Carleton Review Commission, Ottawa: Government of Ontario, 1976, pp. 2-3.
8. M. Branch. Planning Urban Environment. Stroudsburg, Penna: Dowden, Hutchinson and Ross, 1974, pp. 209.
9. In examining the difference between the N.C.C. plan and that of the R.M.O.C. for example the Mayo Report noted:

   > "The difference of the N.C.C. plan and that of the R.M.O.C. is one of timing, degree and geographic emphasis. At the moment, the R.M.O.C. plan is going ahead faster, as we think it should, with the Carlsbad Springs area in lower priority".

   (H. Mayo, op. cit., pp. 31).
10. R. Scott, D. Brower and D. Miner, op. cit.
11. D. Brower et. al. Urban Growth Management through Development Timing. New York: Prager Publ., 1976, pp. 153.

CHAPTER 2

URBAN GROWTH

2.1 MEANING AND DEFINITIONS OF URBAN GROWTH:

Among the various definitions coined for the terms "urbanization", "urban growth" and "urban", none can be said to be inherently the best. The Canadian census definition of urban, prior to 1951, was based on the legal municipal status of incorporation as city, town or village. With the rapid growth of suburbs, that is built-up areas outside a city's boundaries, but still an integral part of the City, legal status alone became an inadequate criterion. Population density, i.e., population per square mile, became an increasingly importat component of urban classification. In 1971, a person was defined as an urban resident if his residence was in either:

(1) incorporated cities, towns or villages with a population of 1,000 or over;

(2) unincorporated places of 1,000 or more having a population density of at least 1,000 per square mile;

(3) the built-up fringes of (1) and (2) having a minimum population of at least 1,000 per square mile [1].

In recognition of the varied uses of "urbanization", it may be said that, in its broadest connotation, the process of urban growth or urbanization involves the generation and spread of characteristic features of city life. Urban living, or city life, has at least three major dimensions or forces - demographic, economic and socio-cultural [2]. The demographic dimension has two aspects - increase in the proportion

of population residing in urban centres [3]. From the demographic viewpoint, an urban centre is a densely settled built-up area and the urban population consists of the residents of such areas. The economic forces may be viewed as comprised of a few interrelated variables which may be characterized as follows:

(1) changes in the technology of production including developments of labour and in systems of transportation, communication and exchange, as well as advances in the techniques and machinery of production methods;

(2) changes in the composition of the supply and demand for economic goods and services; and

(3) economic growth [4].

The social forces in the advance of urban growth include political organization and the system for maintaining social order, the legal and ethical system governing the economic relations among individuals and business entities, and the sets of customs, behaviour patterns and values commonly called "styles of living".

Clearly, the preceding classification of urbanizing forces, which has been synthesized from some of the major works in the field of urban studies (Weber, 1899; Grass, 1922, Mumford, 1961; Davis and Golden 1954; Hanser and Schnore, 1965; and Hatt and Reiss, 1957), gives no information about the mechanisms by which urban growth is generated and advanced. This knowledge seems to be most precise, through still quite inadequate, in the field of demographic variation, where it is known that as the population increases so does the number of centres reaching the critical mass and density required for classification as urban. Furthermore, the

change in the proportion of population classified as urban, which is the most commonly accepted measure of change in the degree of urbanization, may be represented as a simple function of the initial level of urban growth and of the difference between the rates of increase in urban and rural populations (where the rates reflect changes in the areal extent of urban settlement). But as soon as one goes beyond such simple necessary relations among demographic changes with the aim of determining how such changes may be interrelated with economic and social factors, the existing knowledge becomes a network of plausible (but very imprecise) substantial interpretations. In one study, urban growth was said to be occurring when:

> "The economy and population are increasing at a sufficient rate to maintain a high level of employment, as well as a diversified and strong tax base, at least equal to or greater than the national economic and population growth rate." [5]

Thus urban growth is conceived broadly and simply as change in the city - whether it be the expansion of population and land area, shifts in land use patterns or transportation systems of the City, changes in the pattern of industrial or commercial development, or alterations in the community's social, political, and economic institutions. It is noted that, whatever degree of conscious control, urban growth occurs as a consequence of various forms of deliberate, often planned behaviour. They may be a complex of seemingly random economic activities of an aggregate of many business firms influencing the economic development of an urban centre. Or these patterns of behaviour may grow out of the policies and programs of public bodies like City Councils and planning agencies, or the decisions and implementing actions of organized private groups such as the banking interests, corporations, labour unions, real estate boards, merchant associations or neighbourhood clubs.

An understanding of urban growth, begins with an investigation of the circumstances which lead to the growth of the existing economic structure and with the determination of the locations of units of new economic activity. Growth rates differ between urban areas. On the one hand, urban areas with rapid growth rates are characterized by high levels of labour force participation or high activity rates and hence low unemployment rates; they show a high incidence of overtime working and, as a result, residents enjoy high per capita average earnings. It could be argued that, on the other hand, slow growing urban areas have lower activity rates, higher unemployment rates and experience out-migration of those with ability and ambition and, therefore, show a more unequal distribution of income at a relatively lower average per capita level. Thus, Goodall (1972) summarizes that within the overall economic system urban growth is largely of an individual nature, for the continued long-run growth of any urban area depends on its capacity to "invent, innovate, or otherwise acquire new export activities". Thus Thompson sees the economic base of the large metropolitan urban areas as:

> "The creativity of its universities and research parks; the sophistication of its engineering firms and financial institutions, the persuasiveness of its public relations and advertising agencies, the flexibility of its transport networks and utility systems, and all other dimensions of the infrastructure that facilitate quick and orderly transfer from old dying bases to new growing ones." 6

2.2 PATTERN OF URBAN GROWTH :

It may be said that urban growth in Canada has partially resulted from and determined the concentration of economic advances at a relatively few specific points in geographical space. Important among the factors that have influeced the spatial concentration of economic

changes and opportunities are: (a) a sequence of technological developments in the fields of transportation and communication, (b) the intensification of division of labour and of the interdependence of units in production processes, and (c) shifts toward more complex and sophisticated production systems. Particular developments in the geographical concentration of economic changes and opportunities tend, in turn, to produce ramifications that have had a powerful cumulative effect upon the advance of urbanization. These ramifications include the mobility of both people and factors of production, which, in turn, influence (a) regional and rural-urban differentials in the natural increase of population; and (b) the attainment of large labour pools and consumer markets in very small geographical areas. The latter is a feature of urban agglomerations that tends to facilitate further advances in the technology of production (and hence further urban growth, up to the upper limits of urbanization).

Some studies suggest that growth in the urban fringe ususally starts with scattered, single family housing on relatively large township and country roads (Larry Martin, 1976). Occasionally, small subdivisions are constructed. Large clusters of housing and subdivisions then follow, often locating in or near scenic areas. Tract developments generally locate where land is extensive, relatively flat and inexpensive.

Once residential development creates a sufficient market and labour force, commercial and industrial growth takes place. Major industrial development usually occurs in planned industrial parks, where accessibility is good and utilities and other services are available. Commercial development often locates in diversified shopping centres. The growth

seldom follows an orderly pattern, but rather skips around, often taking place some distance from existing development. There are several reasons for the so-called "leapfrog development". On is that most scenic and attractive areas for residential development (the most saleable) are often located some distance from existing development.

Secondly, the land located away from existing development usually is cheaper, which interests speculators. Once speculators own land, they can pressure local governments to rezone it for residential, industrial or commercial development which inflates its value.

Finally, leapfrog development is often reinforced by public officials who adopt aggressive growth policies for their suburban communities. While some officials now realize that all forms of urban growth are not necessarilty a blessing and their attitudes toward urban spatial growth are changing from simple quantity to quality and balance, many still retain an aggressive growth policy.

This leapfrog urban spatial growth presents a number of problems for communities in urban fringe areas. A pressing problem is how to provide such urban services as fire and police protection when property tax base is low. Even if a community is able to contract with an adjacent more established community for these services, the cost is often high.

2.3 URBAN GROWTH IN THE TOWNSHIP OF GLOUCESTER:

Urban spatial growth in Gloucester Township is scattered over a wide area. It includes extensive development in and around Manotick in the southwesterly extremity of the Township, along the River Road northward to the City of Ottawa Limits, on Crown lands within the

Canadian Forces Base Uplands, on Metcalfe Road at Kempark, Blossom Park, Windsor Park and northward to the City of Ottawa Limit, in the vicinity of Walkley Road and Russell Road, in the Cyrville area, east of St. Laurent Boulevard, in the Cardinal Heights, Rothwell Heights and Beacon Hill areas, covering the northerly portion of the Township on the west as far as the Ottawa River, in Blackburn Hamlet within the greenbelt, in and around Orleans in the northeast part of the Township and at Carlsbad Springs, south of Mer Bleue and close to the Township's easterly boundary. (See Fig. 2)

In fact developments both old and new are scattered throughout so many different areas that they create a difficult problem for the Township in establishing the most desirable basing points for the provision of the various services. The cost of all local municipal services is increased by the fact that urban development is not concentrated within one section of the Township. Furthermore, the prime base point for the Township's operations at Leitrim is some distance removed from the greatest concentrations of population.

Land use in Gloucester is changing only in one direction, from rural to urban and perhaps also from less intensive to more intensive urban uses. In urban municipalities, it is often suggested that the objective in new development should be to reach and maintain a residential - commercial ratio of 60 - 40. The most desirable financial position would be realized by a municipality in which the development is entirely commercial or industrial of the highest quality. Gloucester's attitude towards new urban development, therefore, should be to pre-plan its moves with the objective of securing desirable forms of urban use which at the same time bring some improvement in the financial operating position of the municipality.

2.4 IMPACT OF URBAN GROWTH ON MUNICIPAL SERVICES:

During the past few years, a series of statutes, propositions, and court decisions throughout the country have been designed to limit urban development. The primary concerns over growth have related to the additional public costs and the major environmental impacts: air quality, water quality, traffic congestion, noise and diminishing open space.

By conducting studies, holding hearings, or sampling public opinion, decision-makers are attempting to determine what factors are most significantly affecting the community as regards reactions to the existing growth rate. In one study (Bureau of Municipal Research, 1976), for the purpose of identifying the most significant areas of concern, a selection of six possible groupings, was allowed, as follows:

- municipal services were strained
- the environment was endangered
- social conflict was increasing beyond control
- financial resources were insufficient to support future growth
- life style was changing with result of harmful public attitudes (e.g. mistrust, apathy)
- an unsound economic pattern was developing

Of these six general categories, the respondents selected two as being far more significant than the other four. "Strained municipal services" and "endangered environment" were mentioned as the number one and number two reasons why growth management legislation was introduced in 15 of the 21 cities under study. Thus we can say that urban growth and municipal services are interrelated and dependent

on each other.

The aim of this study is to find out whether or not urban growth pays for itself ... to establish and classify relationships between urban growth and individual factors that influence the increase in municipal services. The debate involves whether or not all revenues received from new residential/industrial/commercial development in the form of property taxes, sales taxes, community development fees, and a host of other items offset the added costs involved for public safety, public works, education and other required services. It is essential for the private and the public sectors to understand the fiscal impact of new development and to have a refined methodology for its measurement. Therefore we will try to measure the cost versus revenues for all types of spatial urban growth - residential, commercial and industrial - in the Township of Gloucester.

An accounting of all direct and indirect sources of revenues resulting from development is essential to a fair portrayal of the resulting fiscal impact. Some studies reveal that it is often the omission of certain critical indirect sources of revenue that lead to the conclusion that urban growth does not pay for itself.

The issue over whether new development pays for itself is frequently clouded by the concept that one particular source of revenue (such as construction excise tax) should be sufficient to completely pay for a certain public facility or services (such as parks). Arguments that favour raising the tax rate for a particular revenue source often refer to the "deficit" that would result from a lower tax rate, while ignoring the fact that the development may generate excess revenues from other sources that more than balance the deficit from that one source. In

evaluating fiscal impacts, we shall be careful to look at the overall effect of the development on the municipal budget presuming that the use of funds is not directly tied to only one source.

The rising costs of municipal government that have resulted from the rapid suburbanization of Gloucester Township have created a demand for sources of increased revenue. Under the existing system of municipal property taxation, this generally means the enlargement of the tax base in those types of property that produce a net revenue benefit for the Township. Because the property tax is based on the assessed value of land and buildings, while many municipal services now provided are only vaguely related to these factors, certain classes of property and land use are more profitable to a municipality than others.

In general it may be said that residential property represents a burden for the municipal purse, while commercial and industrial property more than pays its own way. The expensive social services that are demanded by suburban homeowners and tenants, are not required for businesses. Not only do businesses require less in the way of municipal services, but they also pay more taxes.

Under the Provincial Legislation that created the Regional Municipality of Ottawa-Carleton [7], the residential mill rate in constituent municipalities of which Gloucester is one, was set at 85 percent of the commercial mill rate for general municipal purposes. In addition to this higher mill rate, businesses must also pay a business tax and various licensing fees, which generates further revenue for the Township.

Obviously, suburban municipalities that have a primarily residential role, such as Gloucester, are financially pressed under this system. This is particularly evident during the early stages of residential growth when

start-up costs are incurred but commercial development has yet to take place. Fortunately, the growth of a commercial sector to service new population and/or industrial growth taking advantage of the enlarged work force usually leads to a reasonable balance between residential and commercial assessment.

In Gloucester, however, the achievement of such circumstances seems removed at present. Changes in the proportions of municipal assessment in residential properties, as opposed to commercial and industrial ones, show a deteriorating rather than an improving trend over the past eleven years. (See: Table No. 2-1). From a high point in 1967, when 27 percent of assessment was commercial or industrial, the Township has slipped to a point where less than one-fifth of its assessment is in business.

Comparison of Gloucester's 1977 assessment with urban and suburban municipalities in the Regional Municipality in Table No. 2-2 reinforces this point. Only the Township of March, which remains predominantly rural, and the Village of Rockliffe, which is entirely residential, have a smaller proportion of their assessment in commercial and industrial property. The Township of Nepean, which bears the closest similarity to Gloucester, is in a markedly better position.

The present residential-commercial assessment split in Gloucester may well discourage some needed business growth. The higher taxes that must be charged to satisfy the desires of the new suburban residents must inevitably fall heavily on businesses. The relatively small number of businesses sharing this burden requires the setting of a high tax rate.

TABLE NO. 2-1*

CHANGING ASSESSMENT IN GLOUCESTER

		$	%	PER CAPITA
1966	Residential and Farm	16,212	73.9	772.00
	Commercial and Industrial	5,716	26.1	272.19
	TOTAL	21,928		1,044.19
1967	Residential and Farm	16,647	73.0	756.68
	Commercial and Industrial	6,166	27.0	280.27
	TOTAL	22,813		1,036.95
1968	Residential and Farm	19,702	74.2	795.33
	Commercial and Industrial	6,875	25.8	327.38
	TOTAL	26,577		1,122.71
1969	Residential and Farm	22,874	74.4	816.68
	Commercial and Industrial	7,877	25.6	281.68
	TOTAL	30,761		1,098.61
1970	Residential and Farm	26,417	76.6	825.53
	Commercial and Industrial	8,066	23.4	252.06
	TOTAL	34,483		1,077.59
1971	Residential and Farm	30,963	75.3	884.66
	Commercial and Industrial	9,748	24.7	278.61
	TOTAL	40,711		1,152.17
1972	Residential and Farm	37,948	79.2	903.52
	Commercial and Industrial	9,942	20.8	236.71
	TOTAL	47,890		1,140.23
1973	Residential and Farm	42,292	82.2	924.35
	Commercial and Industrial	9,161	17.8	134.65
	TOTAL	51,453		1,059.00
1974	Residential and Farm	46,215	83.4	953.10
	Commercial and Industrial	9,161	16.6	189.92
	TOTAL	51,453		1,143.02
1975	Residential and Farm	50,555	83.1	948.11
	Commercial and Industrial	10,299	16.9	193.15
	TOTAL	60,584		1,141.26
1976	Residential and Farm	55,502	82.2	978.16
	Commercial and Industrial	11,988	17.8	211.28
	TOTAL	67,490		1,189.44

TABLE NO. 2-2**

TOWNSHIP OF GLOUCESTER (Population 56,516)	$	%	PER CAPITA
Residential and Farm	60,104,655	81.8	1,063.50
Commercial and Industrial	13,366,048	18.2	236.50
TOTAL	73,470,703		1,300.00
CITY OF OTTAWA (Population 304,462)			
Residential and Farm	585,856,695	62.9	1,942.36
Commercial and Industrial	325,435,165	37.1	1,134.58
TOTAL	931,291,860		3,076.94
CITY OF VANIER (Population 19,812)			
Residential and Farm	23,905,900	68.0	1,206.64
Commercial and Industrial	11,263,415	32.0	568.51
TOTAL	35,169,315		1,775.15
VILLAGE OF ROCKLIFFE (Population 2,117)			
Residential and Farm	6,988,565	99.0	3,301.16
Commercial and Industrial	8,719	0.1	4.12
TOTAL	6,997,280		3,305.28
TOWNSHIP OF NEPEAN (Population 76,947)			
Residential and Farm	68,784,620	73.1	902.59
Commercial and Industrial	29,255,885	26.9	331.41
TOTAL	94,040,505		1,234.00
TOWNSHIP OF MARCH (Population 8,009)			
Residential and Farm	8,605,090	83.1	1,074.42
Commercial and Industrial	1,751,840	16.9	218.73
TOTAL	10,356,930		1,293.16

* Source: Township of Gloucester 10 Year Financial Review, 1975
5 Year Financial Review, 1976

** Source: Regional Municipality of Ottawa-Carleton Finance Department

Many owners and operators considered taxes sufficiently high that they could be forced to move or go out of business. Businessmen must consider municipal taxes as an operating cost before making a location decision [10], and it is natural to expect that most will avoid high tax areas like Gloucester.

2.5 DETERMINATION OF PUBLIC AND FACILITY NEEDS RESULTING FROM DEVELOPMENT:

Critical to the evaluation of the fiscal impact of new development is a determination of the levels and quality of services and facilities that will be required. One of the reasons why there has recently been controversy as to whether growth pays for itself is that the standards that are applied to evaluate new developments actually represent an upgrading from the existing level of services. If City Council has never seen fit to vote sufficient funds to expanded services, nor adopted a Council policy requiring expanded services for new development, a more appropriate lower standard can be used in our analysis.

A second issue regarding public service standards is the manner in which they are expressed. For instance, if the standard is expressed in terms of response time or distance from a public facility to a development, instead of as a ratio to population, it may be that existing facilities are available to serve the development and there are no additional capital costs required. If it can safely be determined that a project will not cause a decrease in the level of services at existing facilities, and that additional facilities will not be required at some time in the future, no costs are attributed to the project for that particular service.

Thus, in finding out the impact of urban growth on municipal services we will seek to analyse the following questions: -

(1) If the services are costing more money due to the growth in that municipality;

(2) If the allocation of municipal costs is towards ongoing expenses or specifically, on growth expenses;

(3) The extent to which the municipality has experienced difficulties in providing these services. If it is facing an increase in its tax base and similar problems;

(4) The overall expenditure on municipal services;

(5) The ratio of expenditure on different services in proportion to total expenditure;

(6) The amount of expenditure on the current account;

(7) The amount of capital expenditures;

(8) Identification of thresholds of municipal expenditure - (i.e. the level of expenditure increase.).

FOOTNOTES

1. Statistics Canada: 1971 Census of Canada, Profile Studies, "The Urban and Rural Composition of Canada's Population", (January, 1976), pp. 12.

2. Hauser, Philip M. and Schnore, Leo F., Eds: "The Study of Urbanization", John Wiley and Sons, Inc. New York (1965), Chapter 1.

3. Eldridge, Hope Tisdale: "The Process of Urbanization", Demographic Analysis, The Free Press, Glencoe, (1956), pp.338-343.

4. Schnore, Leo F., and Peterson, Gene B.: "Urban and Metropolitan Development in the United States and Canada". The Annals of the American Academy of Political and Social Science, 316 (March, 1958), pp. 60-68.

5. Bureau of Municipal Research: Civic Affairs: "Legislative Attempts to Control Urban Growth in Canada", Toronto, (November, 1976), p. 3.

6. Thompson, Wilbur R. - "A Preface to Urban Economics", published for the Resources for the Future, Inc. by The Johns Hopkins Press, Baltimore, (1965).

7. The Regional Municipality of Ottawa-Carleton Act, R.S.O. 1970, Chapter 407.

8. Hendricks, Russell L.: "Property Taxes and Industrial Development" in Tax Institute of America. The Property Tax: Problems and Potentials Princeton, (1967), pp. 72-73.

CHAPTER 3

FINANCING MUNICIPAL SERVICES

Municipal finance, especially taxation, is usually at the forefront of discussion of local government. Municipal governments are able to use revenue but they may have a constitutional or legislative inability to collect sufficient revenue from existing sources to finance local services.

3.1 ASSESSMENT:

Since 1970, all municipal assessment has been done by Provincial Officials, through regional offices in various centres throughout the Province of Ontario. All properties are assessed, but not all are taxed, that is, some are exempt. Table 3-1 shows the total assessment and exempt portion in RMOC and area municipalities. For example, the exempt assessment in the Township of Gloucester is 24.3 percent of the total, while outlying townships have only a small proportion of their assessment exempt, e.g., Rideau at 7.8 percent. The RMOC levy is made according to the equalized assessment of each municipality, and this figure is always much larger than the taxable assessment.

Taxable assessment is of two sorts:

(a) Residential and Farm, and

(b) Commercial and Industrial.

Reference to Table 3-2 shows the proportions of each type of taxable assessment for different area municipalities. Many

Table 3-1

Assessment for RMOC and Area Municipalities

Municipality	Total Assessment (TA) $000's		Exempt Assessment				Equalized Assessment (EA) $000's		TA as % of EA	
	1969	1974	1969 $000's	1969 as % of TA	1974 $000's	1974 as % of TA	1969	1974	1969	1974
RMOC							3,808,266	5,805,593		
Ottawa	1,067,508	1,232,041	346,888	32.5	389,741	31.6	2,829,436	4,049,055	37.7	30.4
Vanier	34,251	39,485	4,001	11.7	4,834	12.2	80,516	173,285	42.5	22.8
Rockcliffe Park	8,443	8,764	1,301	15.4	1,819	20.8	43,855	46,841	19.3	18.7
Cumberland	6,071	10,122	391	6.4	965	9.5	31,715	75,205	19.1	13.5
Gloucester	45,393	73,213	14,632	32.2	17,789	24.3	199,393	350,749	22.8	18.7
Goulbourn	7,044	10,395	723	10.3	1,124	10.8	42,835	85,905	16.4	12.1
March	5,626	10,073	1,215	21.6	2,146	21.4	32,493	72,044	17.3	14.0
Nepean	72,415	99,633	12,174	16.8	15,092	15.1	438,135	705,746	16.5	14.1
Osgoode	6,904	8,037	712	10.3	882	11.0	38,369	66,816	18.0	12.0
Rideau	4,454	8,968	227	5.1	698	7.8	29,929	65,547	14.9	13.7
West Carleton	6,854	8,889	401	5.9	698	7.9	41,592	74,400	16.5	11.9

Source: Municipal Financial Statements

Table 3-2

Taxable Assessment for RMOC and Area Municipalities

	Taxable Assessment (TA) $000's		Residential & Farm as a % of TA		Commercial & Industrial as a % of TA		Taxable Assessment Per Capita	
	1969	1974	1969	1974	1969	1974	1969	1974
RMOC								
Ottawa	720,620	842,300	62.1	62.4	37.9	37.6	2,458	2,850
Vanier	30,250	34,651	69.9	67.8	30.1	32.2	1,232	1,688
Rockcliffe Park	7,142	6,945	98.6	99.0	1.4	1.0	3,083	3,211
Cumberland	5,680	9,157	94.5	96.9	5.5	3.1	761	807
Gloucester	30,761	55,424	74.4	83.4	25.6	16.1	1,098	1,154
Goulbourn	6,321	9,271	89.4	91.9	10.6	8.1	797	891
March	4,411	7,927	96.2	84.2	4.0	15.8	994	1,213
Nepean	60,241	84,541	77.5	73.9	22.6	26.1	1,063	1,183
Osgoode	6,192	7,155	91.9	91.1	8.1	8.9	884	865
Rideau	4,227	8,270	91.2	95.9	8.8	4.1	1,093	1,132
West Carleton	6,453	8,191	95.1	96.0	4.9	4.0	1,275	1,100

Source: Municipal Financial Statements

municipalities in Ontario have fixed opinions about what the proportion of residential to commercial and industrial ought to be. For some reason this ratio is usually taken to be 60 - 40 [1]. Hence, the efforts of some municipalities is bent towards attracting commerce and industry to reach this magic ratio. In the case of Gloucester, the proportion of residential assessment is very high, at 83.4 percent. On the basis of equalized assessments per capita, however, the value of its properties available for municipal taxation are notably low in relation to the population that must be served. The change in this figure for Gloucester between 1969 and 1974 reflects the imprecision of information in an extremely fast-growing municipality. An important reason for Gloucester's adverse position as measured by per capita assessment is the very large extent of tax-exempt properties within its boundaries. Such exempt properties are subject in part to payments in lieu of municipal taxes but in part yield no return to the municipal treasury.

3.2 REVENUE:

The different area municipalities of the Region derive their revenue from three main sources. These are:

(a) The Tax on real property by means of the mill rate;

(b) Payments in lieu of taxes, from the senior levels of government, both federal and provincial;

(c) Subsidies and grants, chiefly from the province.

3.2.1 Local Taxation:

In addition to realty tax (i.e. mill rate upon the assessed value of properties), there is a business tax, which is set as a percentage of the property tax, and varies with the type of business as set out in the Assessment Act. The final category of local taxation is "special charges". These are taxes levied upon a defined group of ratepayers, e.g., those in a specified area, for specified purposes such as local improvements, garbage pick-up, regional fire supply charges (water), etc.

Thus a primary source of local tax revenues is property tax. The heavy dependence on real and personal property taxes by the municipal taxing jurisdiction apparently tends to restrict the level of public services to less than desirable levels [2]. There are, however, public services provided by municipal governments that are not dependent on subventions or other taxes from other levels of government. The revenue for some of these local government services are designed on the basis of cost of service finance. The amount of revenue derived from charges of these services and the quality of these services are closely related. Revenues from licences, fines, fees, and forfeitures are widely used for local government purposes.

3.2.2 Payments in lieu of taxes:

Payments in lieu of taxes are made on exempt properties by (a) the Government of Canada and its enterprises - the largest of these payments are grants in lieu of taxes from the Federal Government, (b) the Ontario government and certain Ontario enterprises, and (c) some municipal enterprises. These payments form a substantive part of municipal revenues for some municipalities.

(a) The largest of these payments are grants in lieu of taxes from the Federal Government. The Federal Policy governing such "grants in lieu" is set forth in the Municipal Grants Act (1970) and earlier Acts. As municipalities cannot tax the Crown, it is entirely within the right of the Crown (in respect of Canada) to define on what properties grants in lieu are paid, or will not, be paid. Before grants in lieu are paid, certain deductions are made from the gross grant for services provided by the Federal Government which are regarded as "municipal type" services, such as police protection (by the RCMP), parks and arterial roads.

Apart from the main grant in lieu, there is a grant on behalf of legislations, others for Crown agencies, and in the case of the capital region, another by the NCC.

(b) The second part of the payments in lieu of taxes is from the Province of Ontario and its agencies, such as the Ontario Housing Corporation, Ontario Hydro, etc.

(c) For municipal enterprises grants in lieu are paid on behalf of local hydro commissions, O.C. Transpo, RMOC Waterworks, etc.

Certain consequences, of course, flow from the payments (or non-payments) in lieu of taxes. One is that the area municipalities benefit from the presence of exempt properties. The totals and percentages of all payments in lieu of taxes may be seen in Table 3-3. For the Township of Gloucester, these contributions were in total, 6.9 percent of its revenue.

3.2.3 Subsidies and Grants:

Subsidies and grants are received primarily from the Province of Ontario, and make up a significant portion of municipal revenues. For the Township of Gloucester (see Table 3-3), they account for 11.8 percent of its total revenue. The grants and subsidies are given under a variety of Acts and are calculated upon several different formulae. The General Support Grant is usually the largest. On top of these, there are specific grants - the largest being for roadways, others may be given for conservation of health, recreation, cultural facilities, liquor licence fees, etc.

As for "Other Revenue", this category includes such items as licences, concessions, fines, penalties and interest on taxes, income from investments, etc.

Table 3-3

Total Revenue - RMOC and Area Municipalities

	Revenue from General Taxation				Revenue from Payments in Lieu of Taxes				Grants and Subsidies				Other Sources of Revenue				Total Municipal Revenue	
	1969		1974		1969		1974		1969		1974		1969		1974		1969	1974
	$000's	%	$000's	%	$000's	%	$000's	%	$000's	%	$000's	%	$000's	%	$000's	%	$000's	$000's
RMOC	10,082*	38.1	24,115*	41.1	-	-	-	-	15,156	57.3	31,721	54.1	1,212	4.6	2,785	4.8	26,450	58,631
Ottawa	60,654	70.7	92,130	72.2	13,148	15.3	21,484	16.8	5,862	6.8	6,811	5.3	6,175	7.2	7,154	5.6	85,839	127,579
Vanier	2,298	76.6	4,766	75.2	6	0.2	58	0.9	461	15.4	1,054	16.6	236	7.9	463	7.3	3,001	6,341
Rockcliffe Park	621	79.4	981	79.2	72	9.2	163	13.2	48	6.1	59	4.8	41	5.2	36	2.9	782	1,239
Cumberland	583	68.9	1,367	68.5	5	0.6	167	8.4	208	24.6	299	15.0	50	5.9	164	8.2	846	1,997
Gloucester	3,388	70.3	9,623	75.6	651	13.5	878	6.9	554	11.5	1,505	11.8	228	4.7	722	5.7	4,821	12,729
Goulbourn	884	77.9	1,482	65.9	2	0.2	10	0.4	206	18.1	415	18.5	43	3.8	340	15.1	1,135	2,248
March	653	67.9	1,416	71.6	142	14.8	203	10.3	133	13.8	146	7.4	35	3.6	213	10.8	962	1,978
Nepean	9,621	82.4	19,697	79.9	554	4.7	1,081	4.4	1,077	9.2	1,695	6.9	417	3.6	2,164	8.8	11,669	24,637
Osgoode	574	72.5	1,033	73.8	3	0.4	3	0.2	193	24.4	249	17.8	22	2.8	115	8.2	792	1,400
Rideau	500	72.0	1,149	61.3	12	1.7	22	1.2	156	22.5	646	34.5	25	3.6	58	3.1	693	1,875
West Carleton	563	53.7	1,166	64.4	23	2.2	35	1.9	439	41.9	504	27.8	24	2.3	105	5.8	1,048	1,810

Source: Municipal Financial Statements
* Regional Levy

Under Ontario legislation, municipalities are required to utilize the property tax filed in a specified manner. In preparing the annual estimates, the property tax becomes the residual source from which most of the locally-derived revenues must come to produce a balanced budget. The rates to be levied against residential and farm and commercial and industrial properties are in effect determined by statute once the amount of money to be raised and the taxable assessments are known.

As a constituent municipality within a two-tiered municipal region, the residential mill rate of the Township of Gloucester for both regional and general municipal purposes must be 85 percent of the commercial mill rate. The legislation does not make the position plain with respect to special charges. Hence, the regional fire supply levy has been the same for commercial and residential taxpayers whereas the 15 percent reduction has been applied to other special purpose levies.

3.3 EXPENDITURE:

On the expenditure side, municipalities have greater discretion. They can make a choice, for example as to the extent of street lighting, sidewalks, parks and recreational facilities and services they will provide. They are required to furnish some services, however, up to specified provincial standards. Even with the element of choice that applies to municipal spending, however, sufficient uniformity results to produce a predictable relationship between the cost - benefit position of broad classes of properties - commercial and

industrial, urban, residential and farm.

Local current spending has increased since 1969 until 1976, by a total of some 128 percent. Looking at the seven year rate of increase in municipal spending one sees that the expenditures of the RMOC have increased more quickly than the aggregated lower tier. However, several of the area municipalities individually have experienced more rapid spending increases than the RMOC. In part, the rapid increases in townships such as Nepean, Gloucester, Rideau and Cumberland can be explained by population growth. If their expenditures are analyzed on a per capita basis, which separates out the growth component, one can see their spending increases are not nearly as dramatic. (See Table 3-4)

We can try to explain why the increased spending took place. Besides simple growth in the number of people to be served, there are several other factors which account for the increases in municipal spending. In general terms, these are:

(a) Inflation,

(b) New or expanded services, and

(c) Upgraded or improved services.

In a comparative analysis of municipal spending over the period 1970-1975, throughout the province, conducted by the Ministry of Treasury, Economics and Intergovernmental Affairs (TEIGA), inflation was cited as the single most important factor contributing to the higher costs of municipal government [3]. The general rate of national inflation during the period 1969-1975, as measured by the Consumer Price Index, was 47 percent. New or

TABLE 3-4
CURRENT MUNICIPAL EXPENDITURES (1969 - 1975)

	Total ($000's)			*Per Capita*		
Municipality	*1969*	*1975*	*% Increase*	*1969*	*1975*	*% Increase*
Ottawa	38,480	79,182	106	131	262	100
Vanier	1,804	5,359	197	76	266	250
Rockcliffe Park	317	558	76	141	250	77
Cumberland	346	1,570	354	46	137	198
Gloucester	2,019	9,423	367	72	177	146
Goulbourn	385	1,414	267	56	113	102
March	321	1,138	255	73	165	126
Nepean	3,757	16,047	327	66	217	229
Osgoode	325	928	186	46	112	143
Rideau	237	868	266	61	110	80
West Carleton	572	1,135	98	113	146	29
RMOC only	26,530	82,842	212	60	163	172

SOURCE: Municipal Financial Reports. 1969 - 1975.

improved services have certainly played a large role in increasing municipal costs. But it would be foolish to blame the municipalities, for higher spending, when the public has demanded more and better services. Expansion of services has contributed strongly to cost. In addition to the spending increases associated inevitably with growth in the suburbs, there are increases due to improved levels of service. The culture and recreation field (including "community development") is among the fastest growing. Planning at the local level has also shown a strong increase. Table 3-5 increases in spending by category for each of the area municipalities. Taking into account all the factors mentioned, one finds it impossible to sustain a charge of extravagance or incompetence.

TABLE 3-5

Area Municipalities, Current Expenditures by Category ($000's), 1969-1975

	General Government			*Protection*			*Transport*			*Environment*			*Recreation & Culture*			*Planning & Development*		
	1969	*1975*	*% Increase*	*1969*	*1975*	*% Increase*	*1969*	*1975*	*% Increase*	*1969*	*1975*	*% Increase*	*1969*	*1975*	*% Increase*	*1969*	*1975*	*% Increase*
Ottawa	3,585	13,826	286	12,377	26,481	114	8,567	12,528	46	2,866	7,063	146	6,078	14,590	140	1,067	2,406	125
Vanier	214	1,001	372	625	1,690	170	409	669	64	250	674	170	144	507	252	23	744	•
Rockcliffe Park	61	118	93	90	140	56	112	117	5	57	120	111	6	57	850	0	5	•
Cumberland	28	141	404	27	208	670	215	621	189	6	132	•	16	377	•	1	89	•
Gloucester	221	1,820	724	540	2,633	388	510	1,670	227	283	603	113	157	2,151	•	80	485	506
Goulbourn	61	326	434	60	111	85	184	363	97	25	117	368	16	432	•	5	64	•
March	45	171	280	43	167	288	127	252	98	30	77	157	36	415	•	11	43	291
Nepean	340	1,426	319	1,026	3,863	277	583	2,006	244	992	2,852	188	465	4,416	850	39	430	•
Osgoode	35	138	294	13	59	354	198	356	80	2	34	•	24	225	838	4	116	•
Rideau	28	163	482	13	91	600	158	412	161	2	49	•	4	123	•	2	25	•
West Carleton	52	249	379	46	106	130	419	5656	57	8	35	338	8	32	300	8	53	563
Total	$ 4,670	19,389	315	$14,860	35,549	139	$11,482	19,650	71	$ 4,521	11,756	160	$ 6,954	23,325	235	$ 1,240	4,460	260

Source Municipal Financial Reports, 1960 and 1975

* More than 1,000%

Note The educational and regional levies are omitted as well as several small expenditure categories.

3.4 MUNICIPAL SERVICES:

The major issues and problems regarding urban growth and municipal services have already been outlined at the end of Chapter Two. After discussing municipal finances, we will now try to explain municipal services, their costs and how they are affected by urban growth and their provision in the Township of Gloucester.

Urban growth and extension dictate the terms and requirements of municipal services. If there is more urban growth, more municipal services are required. Even the increase in different types of services depends on different types of urban growth. Empirical research has, therefore, concentrated on some of the concepts, such as the relationship between unit cost and volume of individual public sector services. Most of the studies, (Bradford, Malt & Oates, 1969; Green, et. al., 1972; Muller 1973, Springler, 1963; Sternlieb 1973) which have been based primarily on United States data, have been statistical cross-section studies of urban expenditures by type of function and by total, sometimes adjusting for income and sometimes not, depending on what is the focus of the investigation.

Thompson points out that much of the investigation of urban expenditures has been criticized for diffuseness and uncertainty about what is being measured and about the implications of using alternative formulations. It has been asked many times whether such studies of expenditure determinants measure demand or supply factors. Therefore, it is essential to define the variables. As Musgrave has put it:

> "The "service" function combines a mixture of supply and demand factors which need to be disentangled if the really interesting insights into the fiscal behaviour of communities are to be obtained. To some extent, this might be accomplished by separating demand variables such as income and demographic factors, from supply variables, such as climatic conditions or wage rates. To illustrate, the cost of a range of service levels for snow removal (i.e. absence of snow on streets) will depend on factors such as snowfall, density, topography, wages and so forth. This is the cost function part of the problem. Service levels provided will then be a function of these costs and of demand factors, such as incomes, tastes and other prices. The general expenditure function is unsatisfactory both because the dependent variable is poorly defined (i.e. in terms of expenditure rather than service levels) and because the independent variables combine cost and demand factors without due separation. While certain variables may bear on both sides of the picture (density reduces the cost of fire-fighting per house, but raises demand by increasing the cost of conflagration) on a better separation is hardly an insoluble problem [4]".

Each property within a municipality is responsible for a share of the annual expenditure incurred by the municipality and for a portion of revenues from which services are financed. Certain services are provided on a user charge basis. This is true, for example, of electricity, water supply, except water drawn from hydrants and from wells for fire protection. In other instances, user charges may account for part of the cost of a service but a further cost must be recovered through taxation. Public recreation services provide one example.

3.5 EXPANSION OF MUNICIPAL SERVICES AND RELATED COSTS:

The local government expenditures have accelerated from the rapid rate of increase in urban growth for the past several years. In the Ottawa-Carleton Region itself, from 1969 to 1975, there was a 215 percent increase in the total municipal expenditure on services. Dramatic increases in these outlays have occurred for public welfare and higher education.

Spending on health and hospitals also has risen very sharply. The problems in cities have accelerated the pressure for increases in both the scope and quality of public services. It is assumed that some increases in public spending are complementary to expanding populations in suburban areas. But the increase in the amount of local, particularly municipal, expenditure outlay is attributable to other factors that relate to size and population density relationships within urban areas.

According to the 1976 Federal Census, the Township of Gloucester was the fastest growing municipality of over 50,000 persons in Canada [5]. Between 1971 and 1976, more than 20,000 people were added to bring the population up to 56,741 - a 56.21 percent increase. This substantial population increase has had major implications for municipal expenditure levels and the Township's tax base. As well, new problems have arisen as a result of the changing nature of the Township (from rural to suburban to urban) under the influence of new development and because of the increasing scale of all the difficulties inherent in municipal administration. The extreme rapidity of Gloucester's growth has created an almost classical suburban situation characterized by imminent financial squeeze, a truncated local economy, and general social underdevelopment [6].

In the early 1960's, Gloucester's population was dispersed and primarily rural in nature. With the onset of suburban development in the mid-sixties, it was necessary to expend substantial revenue for what are termed "start-up costs". Prior

to the development period, the common amenities of urban living such as sewage, refuse disposal, parks, and protection services were minimal or virtually non-existent. Population growth required the expenditure of considerable public money to start up or develop these kinds of services and or expand the existing bureaucracy. In other words, "start-up costs (are necessary for) the creation of the human organization and physical facilities necessary to deliver public services."[7] According to one authority, on the subject, the most important determinant of municipal costs may be the "rapidity" of change and its effects in disrupting the existing organizational routine[8].

In a period of rapid population growth, there are two other social factors that exert influences on the level of municipal expenditures. First, suburbanites have certain expectations with regard to the provision of public services. People migrating from city to suburb expect the same high level of services to be provided in a newly developed municipality as was available in their previous place of residence. Secondly, studies[9] have shown that suburbanites have a disproportionately high number of school-age children. Therefore, expectations of suburbanites and the need for more schools and teachers have an important impact on local expenditures.

In the case of Gloucester, statistics confirm these hypotheses. Table 3-6 indicates the growth in municipal expenditures as a whole and on a per capita basis from 1966 to 1976.

TABLE 3-6

GROWTH IN MUNICIPAL EXPENDITURES 1966 - 1976

YEAR	POPULATION	TOTAL MUNICIPAL EXPENDITURES	PER CAPITA EXPENDITURES
1966	21,000	$ 3,014,000	$ 143.52
1967	22,000	3,503,000	159.23
1968	21,000	4,188,000	197.49
1969	28,000	4,821,000	172.18
1970	32,000	6,285,000	196.41
1971	35,000	7,169,000	204.83
1972	42,000	8,041,000	191.45
1973	43,753	10,245,000	211.29
1974	48,459	12,787,000	263.71
1975	53,322	17,365,000	325.66
1976	56,741	22,295,000	392.93

SOURCE: Gloucester Township, 10 Year Financial Review, 1975
5 Year Financial Review, 1976

As evidenced in this table, there has been a sharp increase in per capita expenditure since 1973. This has resulted from across the board increases in municipal costs for "general" purposes such as administration, road works, and protection service, and for schools.

3.6 ECONOMIES OF SCALE IN MUNICIPAL SERVICES:

Studies indicate a pattern of decreasing and rising costs for specific services within certain size of municipalities. [12] Economies of scale are of significance in the provision of public services only as a community grows from a small to an intermediate size. Selected public services that have several different sequential production levels, such as water supply and sewage disposal, do reflect substantial economies of scale until the area to be served is very large. Two analysts studied operating costs of secondary sewage plants in an eastern seaboard state in the late 1950's. The researchers found a substantial decrease in the cost per million gallons of sewage treated as the plant size increased [10]. In a study of the cost of operating sewage treatment plants in Toronto, cost differentials related to size or volume of operation were also in evidence. In one plant, with a daily capacity of three (3) million gallons, the cost was $55 per million gallons. At another plant, with 50 million gallons per day capacity, the cost per million gallons was $33 [11]. Economies of scale may occur if the expansion of public facilities occurs in communities with excess capacities.

Thus there may be short run economies in the provision of public services that are associated with population densities or particular population concentration or distribution. But the form of population concentration and distribution in large cities may also escalate the cost of the provision of all services.

According to Stocks [13], it makes sense to channel commercial, industrial and residential development, where feasible, into areas with excess capacity of public facilities, rather than encourage growth in presently underserviced areas or places with inadequate capacity ..... New firms or households locating in the area of excess capacity will spread fixed service cost per user until capacity is utilized ..... Through appropriate land use planning, coupled with effective zoning provisions, it is possible to avoid much of the cost of "leapfrog" development and thus promote efficiency in the public sector.

3.6.1 IMPACT OF ECONOMIES OF SCALE ON PLANNING MUNICIPAL SERVICES:

Most of the Township of Gloucester lies within or beyond the greenbelt surrounding the City of Ottawa. All land on the inner side of the greenbelt is expected to undergo urban development if it has not already done so. Certain land within the greenbelt has also been allowed to be developed: Blackburn Hamlet affords the major illustration. Controlled urban uses may be expected to take up further greenbelt acreages but the emphasis today is on the outer side of the line. Community water and sewer services are already

being developed by the regional municipality. From the reports on Official Plans and Development Plans of different areas of Gloucester Township, it is clear that the northeast and southwest portions of Gloucester are slated for continuing urbanization whereas considerable territory in the south-central and southeast part of the Township must either remain as it is or develop in ways that are acceptable in the absense of community water and sewer services. The reason for this is that if new development is planned in the greenbelt area, then it will be very expensive as all the required community services for that growth will have to be provided.

Thus, economies of scale do play an important role in determining the expenditure on municipal services. In the case of Gloucester Township, their impact will be discussed in the Chapter on data interpretation and analysis.

3.7 THE FISCAL DISPARITIES:

Fiscal disparities within the metropolitan area itself are compounded by fiscal distortion inside and outside of urban areas. The total local government expenditures on a per capita basis are about 33 percent higher in a metropolitan area than in non-metropolitan areas. The principal factor in the higher level of urban spending is the more extensive and intensive requirements for public services that occur in areas with dense population. The requirement for higher expenditure for services occurs in almost all local government metropolitan functions

with the exception of street management and education. Highway expenditures seem to be lower in metropolitan areas while education expenditures tend to be about the same in metropolitan and non-metropolitan areas.

With regard to revenue, there has been a steady increase in local tax levels from non-metropolitan areas to central cities with central cities being nearly twice as high on a per capita basis as non-metropolitan areas and 38 percent higher than those from outside the central city. The tax differences are greater, proportionately, than expenditure differences, and the gap is largely expanded by the pattern of intergovernmental aid. The least aid is received by central cities and the most by non-metropolitan areas. The differential in aid between metropolitan and non-metropolitan areas is consistent with the differences in aid between central cities and their outside areas.

The report of the (U.S.) National Commission on Urban Problems [14] documents the growing disparity in the relative fiscal capacity between central cities and suburbs. The higher expenditure needs in the cities are significant factors in the cities' capacity to deal with local problems. Three fundamental factors were cited as contributing to the fiscal problems in metropolitan areas:

1. the central city is where the poor and disadvantaged tend to be concentrated. These are high cost citizens from the point of view of requiring poverty linked services such as public assistance, hospital care,

housing, and other social services (though some are provided by the province).

2. population concentration increases the scope of costly functions such as police, and fire protection, sanitation, recreation and parks.
3. the central cities developed before suburbia and their public facilities and sewage include a higher percentage of deteriorated structures which need replacement or renovations.

These factors, plus others, mean that most central city areas have higher costs than the average area in the suburban fringe.

As costs and expenditures increase over the near short term, the ability of municipalities to provide needed service rests with the future pattern of revenue flows.

The more urbanized municipalities within the Regional Municipality of Ottawa-Carleton expend more money on the protection of people and property than on any other municipal service. Included within the category are fire protection, police services, protective inspections and street lighting. Outlying municipalities spend relatively less on these functions (See Table 3-7). Fire prevention and protection are the responsibility of the area municipalities. Within the region, there exists a variety of arrangements for the provision of these services. These disparities exist in the case of all services. As an example, we can take fire protection services.

TABLE 3-7

FIRE SERVICES FOR AREA MUNICIPALITIES - EXPENDITURES

	1969		1974	
	$000's	% of TRE	$000's	% of TRE
Ottawa	4,885	82.6	8,581	73.3
Vanier	249	4.2	555	4.7
Rockcliffe Park	51	0.9	97	0.8
Cumberland	14	0.2	129	1.1
Gloucester	183	3.1	950	8.1
Goulbourn	28	0.5	76	0.6
March	33	0.6	109	0.9
Nepean	438	7.4	1,101	9.4
Osgoode	5	0.1	16	0.1
Rideau	6	0.1	45	0.4
West Carleton	23	0.4	47	0.4
Total Regional Expenditure (TRE)	5,915	100.0	11,706	100.0

SOURCE: Municipal Financial Statements

As shown in the above Table, expenditures by area municipalities for fire services have increased by 98 percent from 1969 to 1974, whereas in the Township of Gloucester, this increase has been 219 percent because urban growth in this Township has been most rapid and extensive. While expenditures by area municipalities for fire services have increased since 1969, the City of Ottawa continues to spend three-quarters of the total Regional expenditures on fire services. On a per capita basis, Rockliffe Park spent the most at $44.74, followed by Ottawa and then Vanier. The rural townships spent the least on fire services, with Osgoode the lowest at $1.54 per resident.

In our study we will attempt to use cost estimates that apply to the requirements of a particular development rather than to use an average cost figure. Developments frequently differ substantially from the average, and it is exactly this difference that may be responsible for a project generating a surplus revenue rather than a deficit. For instance, a previous study conducted by Ashley Economic Services in the City of San Diego,[15] clearly shows that it is the older, less desirable portions of a city that contribute to disporportionate share of the costs of municipal services rather than new subdivisions. Projects also differ in their specific location which may require higher city costs if the growth is in an outlying portion of the city that is not readily served by existing services. The socio-economic characteristics of residents of a new development have a very real effect on both the demand for services such as police protection, and revenues guaranteed, such as through retail

sales tax. The size of families as well as the age of children also affects the need for services, particularly schools.

The characteristics of a particular growth experience also influence the "effective" need for services; a planned residential development with private common areas and recreational facilities obviously reduces the effective need for public parks. Another reason for avoiding the use of average cost factors is that they often overstate the marginal or incremental costs to the municipality as a result of the new development. Incremental costs occur when city departments have achieved certain economies of scale or efficiency.

FOOTNOTES

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12. (Bish & Warren 1972; Breton 1965; Tiebert 1956; Will; Stigler 1958).

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CHAPTER 4

METHODOLOGY AND INTERPRETATION OF DATA

In the previous chapters different aspects of urban growth were studied in order to determine the factors that quantify urban growth with special reference to the Township of Gloucester. These factors have been discussed later in this chapter. Urban growth and extension dictate the terms and requirements of municipal services. If there is more urban growth, more municipal services are required. Municipal finances, their sources, municipal services and expenditure were also discussed in detail. The objective of the study is to find out whether or not urban growth pays for itself, to establish and classify the relationships between urban growth and individual factors that influence the increase in municipal services. The major discussion involved whether or not all revenues received from new residential, industrial and commercial development in the form of property taxes, sales taxes, community development fees and a host of other items offset the added costs involved for public safety, public works and other required services. Thus, it is essential to understand the fiscal impact of urban growth and to have a refined methodology for its measurement. The previous chapter dealt with the complex relationship which exists between the different aspects of urban growth and expenditures on municipal services. This chapter aims at testing this relationship against empirical data. It is divided into two sections - one dealing with the methods of approach and the other with the interpretation and analysis of data.

4.1 METHODS OF APPROACH:

Here, an attempt has been made to develop a technique which will allow us to study the impact of the different types of urban growth on municipal services. Any of the following methods could be adopted for this study: -

1. Making direct interpretations from the raw data.
2. Studying trends in the data using Variance Analysis.
3. Comparing different trends using Correlation Analysis.
4. Statistical Models of Patterns based on Multivariate Analysis (such as Factor Analysis).
5. Combinational types of Approaches are also possible, for example, Indexed Trend Analysis.
6. Bi-variate or Multivariate Time Series Analysis using Correlation or Regression Techniques.

In this study, the last two approaches, namely, Indexed Trend Analysis and Regression Analysis have been used.

4.1.1 INDEXED TREND ANALYSIS:

In many instances adequate data are not available in a form which can be analysed using complex multivariate techniques. In such cases, Indexed Trend Analysis is a more appropriate technique. Another reason for selecting this approach is that the process of indexing reduces the data to a comparable basis, for example, comparisons can be made between variables as well as between years.

As is obvious from the name, under this approach, first all the data are indexed.

- Secondly, the indexes are plotted on graphs.
- Thirdly, on the basis of the graphical presentation, the trend is analysed using Regression Analysis.
- Fourthly, results are interpreted.

The Township of Gloucester is a small municipality which recently started growing. For this study, required data could not be achieved prior to 1970, because of the inefficient methods of recording data. One of the major reasons is that there was a fire in its municipal offices in 1973, when most of the records were lost. It is only for the last two or three years that they have started updating them. Therefore this study has been limited to a period of seven years from 1970 to 1976 inclusive, where 1970 is taken as a base year. Thus, with such a small data set, the best approach would be to adopt the method of Indexed Trend Analysis for this case study.

4.1.1.1. Steps for Developing the Technique:-

1. Raw Data - In the entire study, the concentration has been on two main items: - (a) Urban spatial growth
(b) Expenditure on municipal services

(A) Due to the data constraints, the following assumptions have been made with respect to the elements which make up urban spatial growth:

- number of building permits issued represents number of houses built
- number of business permits issued is equivalent to number of industrial and commercial (business) establishments
- road mileage is a direct indicator of spatial growth

(B) In the Township of Gloucester similar municipal services have been grouped under six (6) different headings. In order to get comparable results, only five (5) of these categories could be selected for which complete data are available from 1970 to 1976. These have been described in greater detail in Figure 3.

All the raw data have been tabulated in Appendix 'A'.

2. The raw data has first to be simplified into indexes that measure the various aspects of growth factors and municipal services in which we are interested.

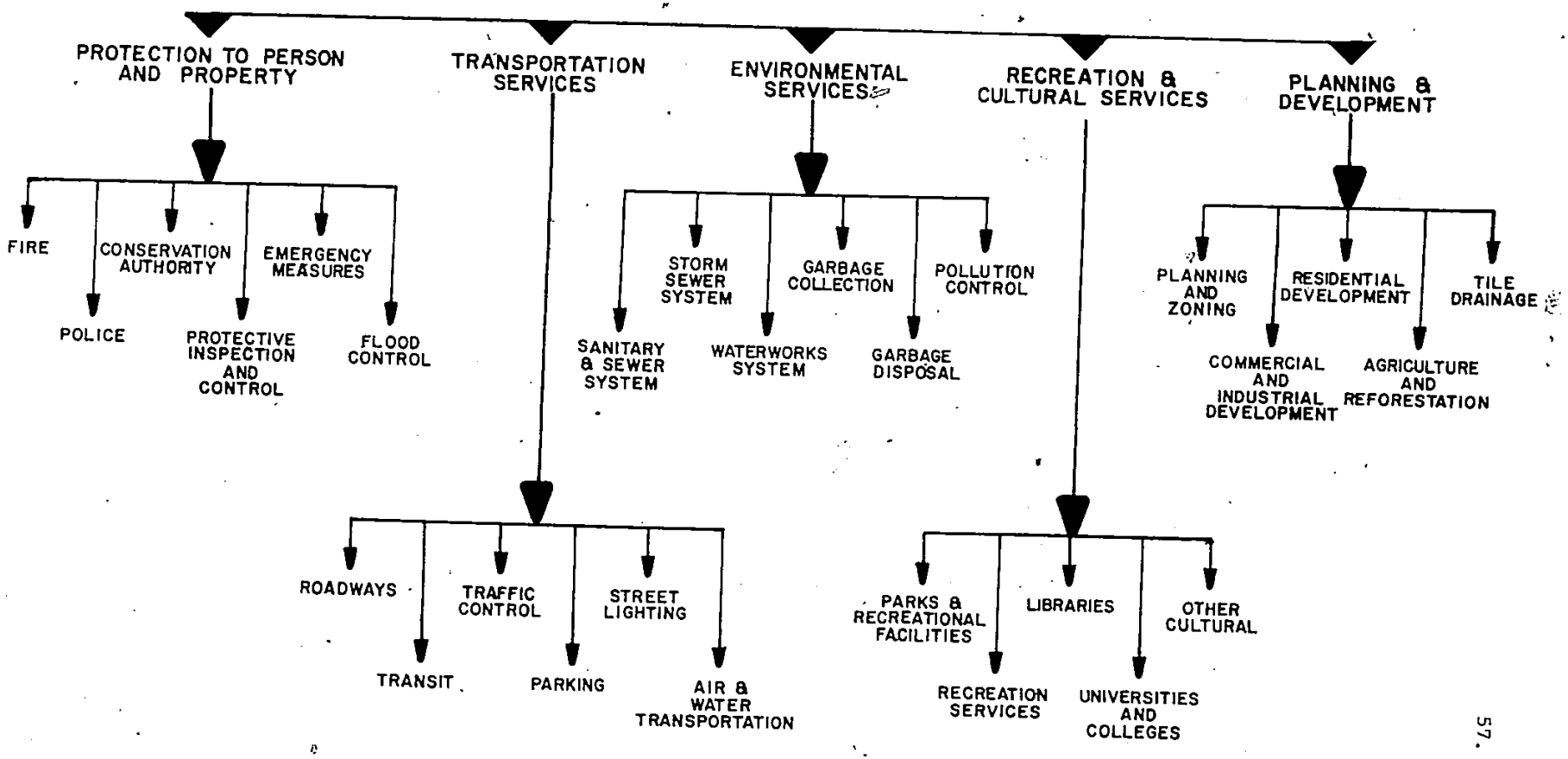
Data normally consist of a series of figures for one or more categories of the phenomenon (growth/services) concerned. Data are frequently encountered in two different forms [1] -

(i) They might consist of a series of measurements of a particular phenomenon on a continuous scale,

(ii) They might be observations of the frequency of an occurrance either of an object or a particular value (e.g. how many times more than a particular amount was spent on a particular service).

FIGURE - 3

CATEGORIES OF MUNICIPAL SERVICES



All the data for this study are on continuous scale. The technique used here for indexing the urban spatial growth and the municipal services is similar to the one used for consumer price indexing in Economics. Had the data been of type (ii), that is, frequency type, then we would have adopted the normal distribution technique for indexing.

4.1.1.2. Calucations for Indexing:

Definition: -

An index number is a statistical measure designed to show changes in a variable or group of related variables such as urban growth or expenditure on services with respect to time. Although mainly used in business and economics, index numbers can be applied in many other fields. For example, by using index numbers we can compare expenditures on services in a municipality during one year with those of a previous year. There are many types of indexes out of which two are (i) Link Relative Index Number, and (ii) Simple Index Numbers [2]. These are the two general types of indexes that are used for our purposes and are constructed from time series data. These indexes shall be normalized by adding 100 (the assumed value of base year) to them. Thus -

(i) Link Relative Index Number is defined as:

$$LI = 100 + \frac{(Yn - Yn\text{-}1)}{Yo} \times 100$$

where Yn = value in current period

$Yn\text{-}1$ = value in the year preceeding the current year

Yo = value in the base year

(ii) Simple Index Number is expressed as

$$SI = 100 + \frac{(Yn - Yo)}{Yo} \times 100$$

where: Yn = value in current year

Yo = value in the base year

Before calculating the expenditures on various municipal services, an attempt has been made to determine the criterion for the measurement of urban spatial growth. This has been done by taking those elements that represent urban growth. According to Davis (1961), the level of urban growth is measured by the percentage of population residing in urban areas. Another method of measuring a community's growth rate can be the value of the building permits issued in a given year [3]. All the determinants of urban spatial growth have been specified in Figure 4. Different types of urban spatial growth, namely residential, commercial and industrial, will also be studied. It is to be noted that industrial and commercial growth have been combined, as separate data are not available.

The next step is calculating the changes in all elements that make up urban growth (See Fig. 4), residential growth (See Fig. 4A), and commercial and industrial growth (See Fig. 4B). In order to determine the amount of growth or the increase in growth on yearly basis relative change (LI) and absolute change (SI), both will be calculated. Thus, the data will be plotted in specific types of indexes made up either of LI's or SI's, which are calculated over the period of seven (7) years from 1970 to 1976, and are further defined as follows:

FIGURE - 4

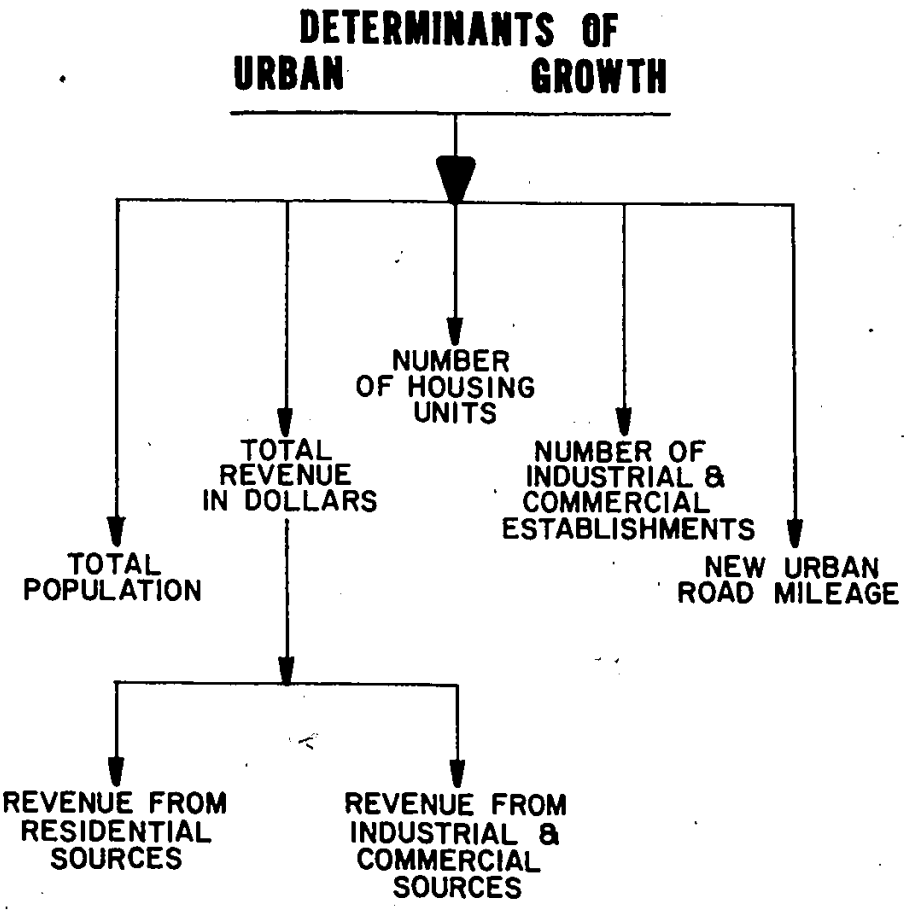

DETERMINANTS OF URBAN GROWTH
NUMBER OF HOUSING UNITS
TOTAL REVENUE IN DOLLARS
NUMBER OF INDUSTRIAL & COMMERCIAL ESTABLISHMENTS
TOTAL POPULATION
NEW URBAN ROAD MILEAGE
REVENUE FROM RESIDENTIAL SOURCES
REVENUE FROM INDUSTRIAL & COMMERCIAL SOURCES

FIGURE - 4A

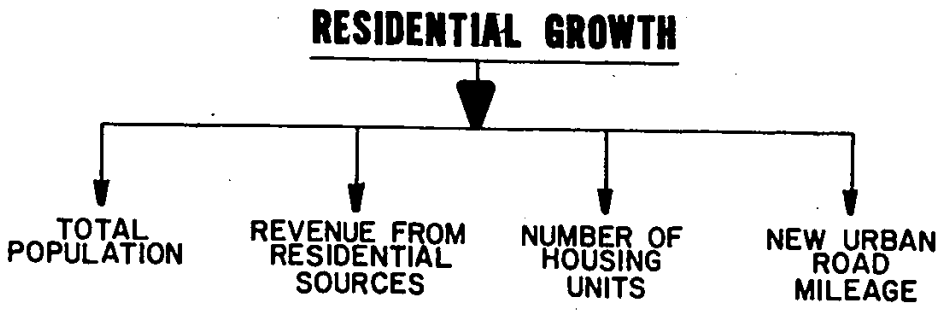
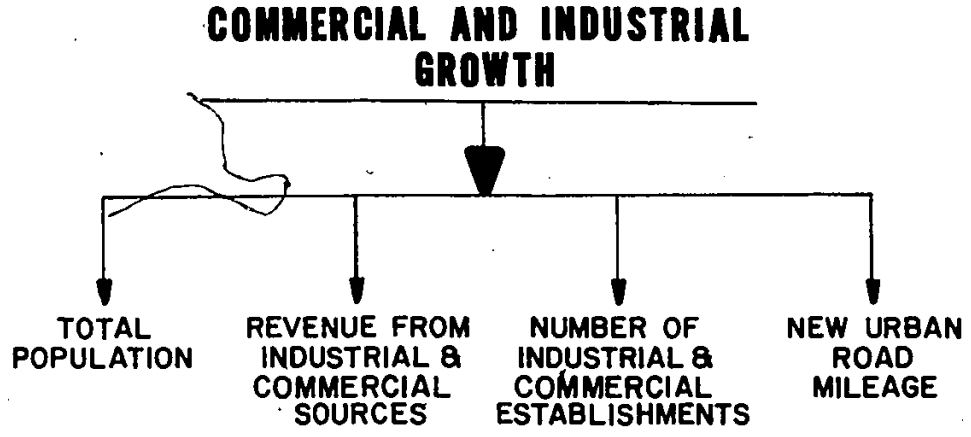


FIGURE - 4B



(A) LI Specific Forms: -

(i) Link Relative Urban Growth Index =

$$LUGI = \sum_{i=1}^{n} LIui/n$$

(ii) Link Relative Residential Growth Index =

$$LRGI = \sum_{i=1}^{n} LIri/n$$

(iii) Link Relative Commercial and Industrial Growth Index =

$$LCGI = \sum_{i=1}^{n} LIci/n$$

where LIui = Link Relative Index for Urban Growth

LIri = Link Relative Index for Residential Growth

LIci = Link Relative Index for Commercial & Industrial Growth

n = Number of Indexes

(B) SI Specific Forms: -

(i) Simple Urban Growth Index =

$$SUGI = \sum_{i=1}^{n} SIui/n$$

(ii) Simple Residential Growth Index =

$$SRGI = \sum_{i=1}^{n} SIri/n$$

(iii) Simple Commercial & Industrial Growth Index =

$$SCGI = \sum_{i=1}^{n} SIci/n$$

where SIui = Simple Index for Urban Growth

SIri = Simple Index for Residential Growth

SIci = Simple Index for Commercial & Residential Growth

n = Number of Indexes

(It is to be noted that each is an average index).

These indexes will enable us to measure growth in quantitative terms. Thus, we will know the amount of growth for every year so that it could be compared with the amount of expenditure on different municipal services in the Township of Gloucester over the period covered by this study.

These indexes are shown as Table Numbers 1 to 12, in Appendix 'A'.

On the basis of the above indexes, several graphs shall be drawn to indicate the trend of growth and expenditure.

4.1.2. REGRESSION ANALYSIS:

The technique of Regression Analysis is used where a correlation coefficient is calculated, which in turn, measures the degree of relationship between the variables. This also determines as to how well a linear or non-linear equation explains the relationship between variables. When only two variables are involved, we speak of "simple correlation" and "simple regression". When three or more variables are involved, then it is called "multiple correlation" and "multiple regression" [4].

Multiple regression is a general statistical technique through which one can analyze the relationship between a dependent or a criterion variable and a set of independent or predictor variables. Multiple regression may be viewed either as a descriptive tool by which the linear dependence of one variable on others is summarized or decomposed, or as an inferrential tool by which the relationships in the population are

evaluated from the examination of sample data [5].

The most important uses of this technique as a descriptive tool are:

1. To find the best linear prediction equation and evaluate its prediction accuracy;
2. To control the confounding factors in order to evaluate the contribution of a specific variable or set of variables; and
3. To find structural relations and provide explanations for seemingly complex multivariate relationships.

In this study, we are interested in predicting the expenditure on municipal services (the dependent variable) from different types of urban spatial growth (independent variables), all of which have been measured on interval scales of one year for the Township of Gloucester. Through multiple regression techniques, we can obtain a prediction equation that indicates how scores on the independent variable could be weighted and summed to obtain the best possible prediction of expenditures on municipal services. We would also obtain statistics that indicate how accurate the prediction is and how much of the variation in expenditure is accounted for by the joint linear influences of the indicators of urban spatial growth. The main focus of analysis is, however, the evaluation and measurement of overall dependence of a variable on a set of other variables.

4.1.2.1 Meaning of Regression Coefficients

In simple regression analysis, values of the dependent variable are predicted from a linear function of the form

$$Y' = A + Bx$$

where Y' is the estimated value of the dependent variable Y. B is constant by which all values of the independent variable X are multiplied. And A is a constant which is added to each case and is often called an intercept.

The difference between the actual and the estimated value of Y for each case is called 'residual', i.e. the error in prediction and may be represented by the expression, residuals = Y - Y'.

The regression strategy involves the selection of A and B in such a way that the sum of the squared residuals is smaller than any possible alternative values. Expressed in another way,

$$\Sigma (Y - Y')^2 = SS_{res} = \text{minimum}$$

It can be shown that the optimum values for B and A are obtained from the following formulas:

$$B = \frac{\Sigma(X - \bar{X})(Y - \bar{Y})}{\Sigma (X - X)^2} = \frac{SP_{xy}}{SS_x}$$

$$A = \bar{Y} - B\bar{X}$$

Where SPxy is our symbolic notation for the sum of cross products of X and Y and SSx denotes the sums of squares of X.

The constant A is the point at which the regression line crosses the Y axis and represents the predicted value of Y when X = 0. The constant B usually referred to as the regression coefficient, is the slope of the regression line and indicates the expected change in Y with a change of one unit in X. The predicted Y values fall along the regression line, and the vertical distances (Y - Y') of the points from the line represent residuals. Since the sum of squared residuals is minimized, the regression line is called the 'least squares line' or the line of 'best fit'[6].

4.1.2.2. Regression Equation:

A "regression equation" is an equation for estimating a dependent variable, say y , from the independent variables x_1, x_2, ... and is called a regression equation of y on x_1,x_2 ... In functional notation this is briefly written as $y = F(x_1,x_2.....)$ read y is a function of x_1,x_2 and so on".

In our study we will try to find out the value of dependent variable - expenditure as a function of independent variable - time. Mathematically, this function can be written as:

$$Y = f(x)$$

The regression equation will be:

$$Y = A + Bx$$

Where Y = expenditure on service (dep. var.)

X = year or time (indep. vari.)

A = constant

B = B coefficient of time

4.1.2.3. Application to Time Series:

If the independent variable X is time, the data show the values of Y at various times. Data arranged according to time are called "Time Series". On the basis of above regression equations, the regression line or curve of Y on X is often used for purposes of estimation, prediction or forecasting. We will use this statistical model to show a trend in the relationship between the urban growth and the provision of municipal services in the Township of Gloucester.

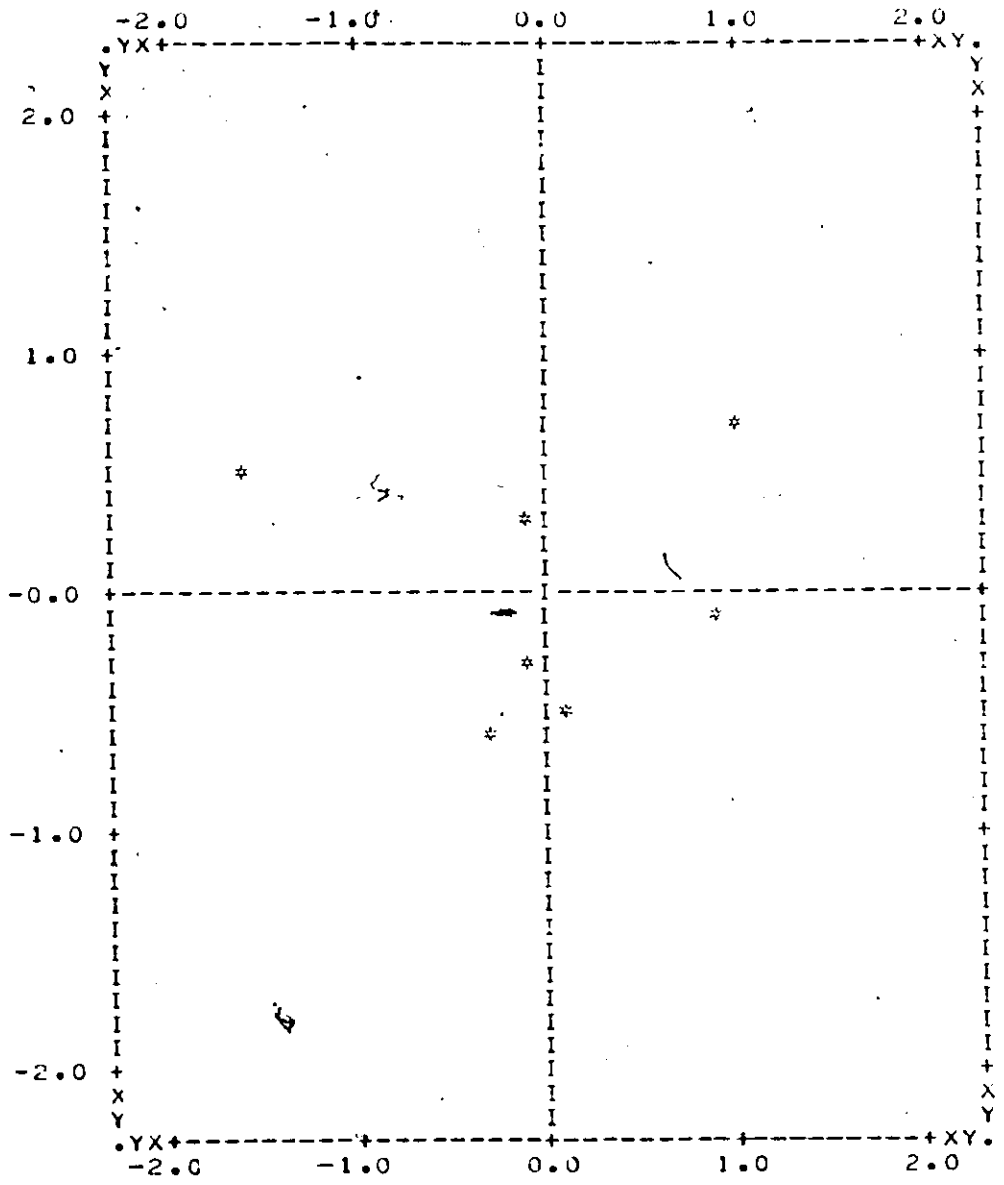
4.1.2.4 Assumptions of Regression Analysis

In the regression analysis procedure there are certain basic assumptions which are normally checked in the specification of data. These assumptions as applied to our models to come later, are as follows:

1. Linearity - Residuals are examined for the linearity. For example we can take the variable 'All Services' from our model. In the case of 'All Services' the coefficient of regression (R^2) is 72 which means that the differences in the value of the independent variable 'explain' 72 percent of the variance in the dependent variable. Such high value indicates a high linearity in the model.
2. Normality of the Distribution of Variables - For this we use Descriptive Statistics and check for normality. The normality of distribution is essential to make predictions. A normal distribution is symmetrical with highest probabilities near the mean, and with probabilities decreasing as distance from the mean decreases. This implies that, in a frequency distribution which approximates to normal, 50 percent of the values will be less than the mean, and 50 percent more than the mean. Before the t-test can be applied it is assumed that the background population is approximately normally distributed. The smaller the sample being tested, the more nearly normal must the background population be for most parametric tests to be valid. If, therefore, the normality of the background population cannot be reasonably assumed, then a distribution-free or non-parametric test (which makes no assumptions about the distribution of the background population) should be used, and this is especially important if the sample being tested is small. Since the sample in our model is always very small, the strength and validity of the relationships shown may be questionable despite the fact that these models satisfy

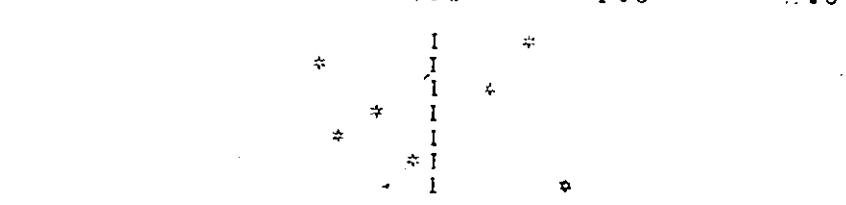
GRAPH 'A'

DEPENDENT VARIABLE: ALLSER VARIABLE LIST 1
REGRESSION LIST 1



GRAPH 'B'

PLOT OF STANDARDIZED RESIDUAL



all necessary statistical requirements.

3. Randon Distribution of the Variables - For the purpose of example we can again discuss the 'All Services' from our model. Looking at 'Graph A' our distribution is not normal but shows a pattern. The test for this is to examine the residuals. The expected value of the residuals should be zero. From the standardized residuals graph (graph B), it is observed that all residuals fall within the acceptable range of $\pm$ 1 standard deviation. It must be stressed, however, that the same assumption (the strength and validity is questionable in all models due to small sample) have to be considered for the regression analysis. Although the data for all services have a normal distribution, in the case of individual services the distribution is highly skewed. This skewness could not be avoided due to small sample; and it reduces the validity of the various conclusions to be made.

4. No Autocorrelation - It implies independence of the cases of the observation units. If there is autocorrelation, we are probably dealing with Diffusion and not with Functional relationships. In our model the sample is very small--only 7 cases. In the case of 'All Services' a Durbin-Watson test shows a score of 2.06. To avoid autocorrelation one should have a (i)large smaple or (ii)random sampling to avoid contiguous units.

5. F Ratio - The F is the ratio of the two mean squares and measures the significance of the regression equation representing more than mere chance. Again in the example of 'All Services', F ratio is 13.05 which means that our model is very good. The expalined is 13 times greater than the unexplained. The discussion with respect to other individual services has been done in the section on interpretation and analysis of data.

4.2. DATA INTERPRETATION:

Once the regression analysis is complete, the next step is to interpret the results. For the purposes of interpretation, the data have been organized in such a way that it is divided in three categories:

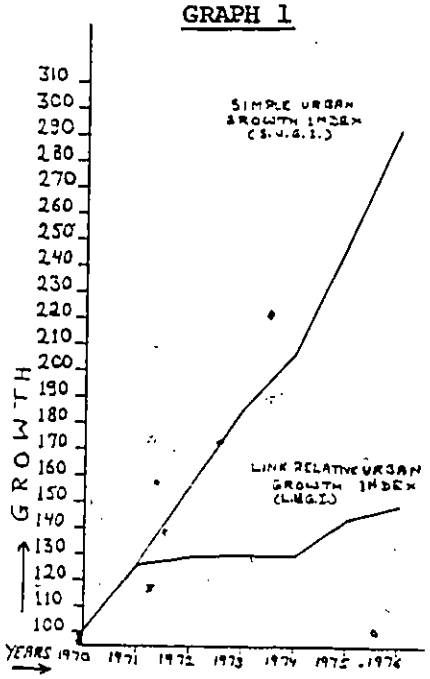
1. Indexed Urban Growth
2. Indexed Expenditure on Municipal Services
3. The Impact of Urban Growth on Municipal Expenditure

4.2.1. INDEXED URBAN GROWTH:

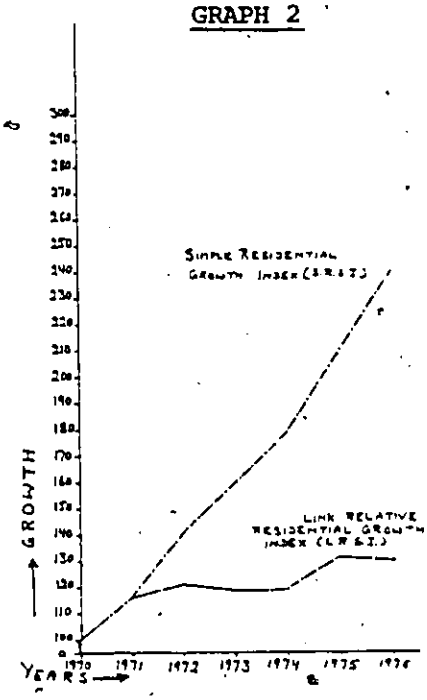
The purpose of indexing the growth is to study the growth pattern in the Township of Gloucester. It indicates in quantitative terms, the measure of urban residential growth, urban commercial and industrial growth, and overall urban growth over the period of this study, that is, from 1970 to 1976. These are shown in Table 4-1 and are graphically presented in Graphs 1 to 6, which represent both link relative and simple urban spatial growth in Gloucester Township.

The link relative growth indexes (L.U.G.I., L.R.G.I., L.C.G.I.) show the annual increase in growth from one year to another and simple growth indexes (S.U.G.I., S.R.G.I., S.C.G.I.) depict the total growth from 1970 to all the other years. From 1974, the rise is very sharp which indicates a sudden rapid growth. The L.U.G.I. shows that from 1971 to 1972 there has been some growth but not very substantial. During 1972 and 1973, it seems to slow down and the actual amount of growth in 1973 is less than the previous year. The reason for this could be that due to inflation, the building industry slowed down and less building permits were issued. Then in 1974 came the boom period. There has been a tremendous growth during 1974 to 1975, four times more than

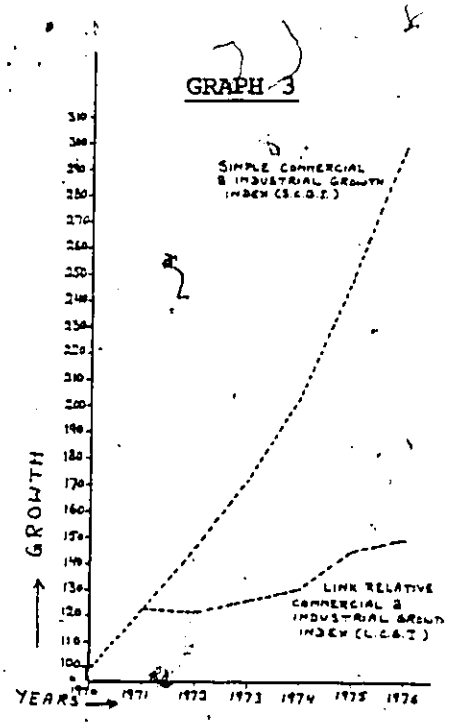
GRAPH 1



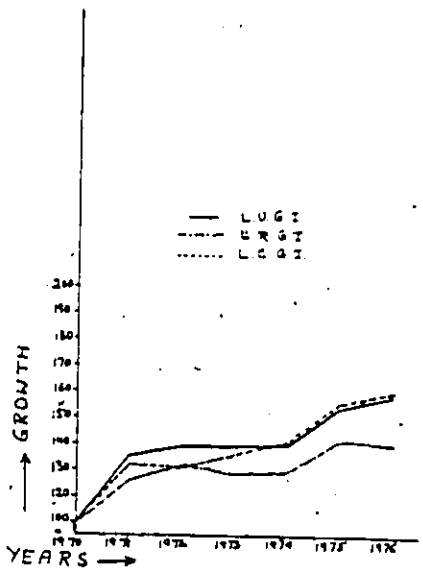
GRAPH 2



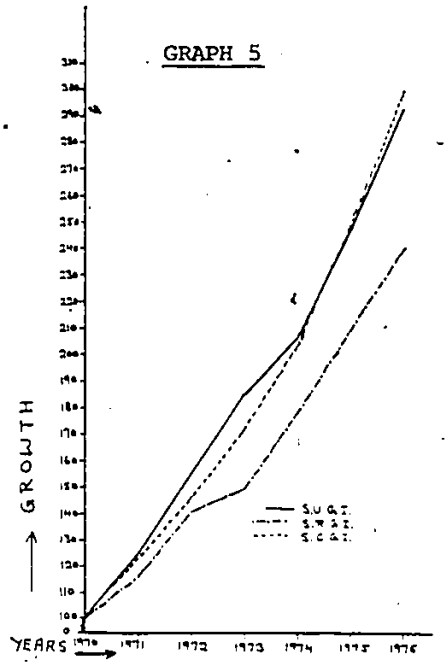
GRAPH 3



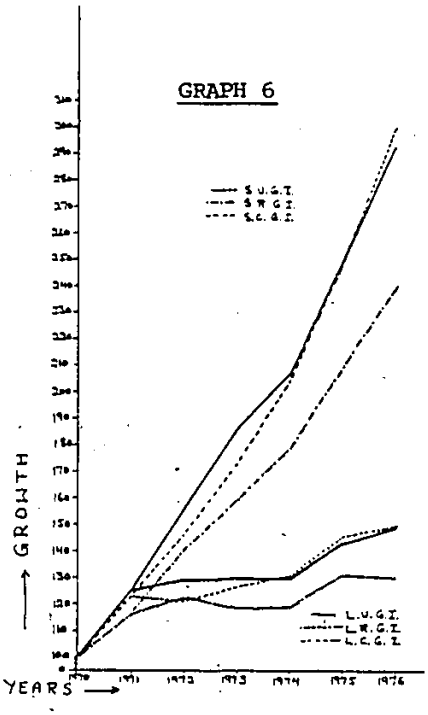
GRAPH 4



GRAPH 5



GRAPH 6



in 1971-72. In 1975 and 1976, the curve is still going up which means that from 1974 onwards there has been a rapid growth and the amount of growth is still increasing whereas before 1974, the rate of growth was very slow in this Township.

This rapid urban spatial growth could be attributed to the fact that there were many new developments in the Blackburn Hamlet and Orleans areas. Before 1974, most of the urban development was in the areas adjacent to the City of Ottawa. But after that it started spreading in all directions - north, east and south. There were developments in Beacon Hill, Windsor Park, Blossom Park and Leitrim areas as well.

The L.R.G.I. indicates a somewhat similar pattern of growth to that of the L.U.G.I. Between 1971 and 1972, there is significant residential growth increasing from 116.3 in 1971 to 122.4 in 1972. These residential

TABLE 4-1

INDEX FOR URBAN GROWTH

YEAR	TYPE OF GROWTH	1970	1971	1972	1973	1974	1975	1976
LINK RELATIVE INDEX (LI)	UGI	100.0	125.1	129.1	129.8	129.3	143.6	148.1
	RGI	100.0	116.3	122.4	118.8	119.1	131.6	130.1
	CGI	100.0	123.0	121.7	126.4	131.5	145.6	149.7
SIMPLE INDEX (SI)	UGI	100.0	125.1	155.5	185.3	207.4	248.0	293.3
	RGI	100.0	116.3	140.4	159.1	178.2	209.8	239.9
	CGI	100.0	123.0	146.4	172.7	204.2	249.7	299.4

developments were in the northeast and Montreal Road areas. After that there is a decline in the housing industry for two years. The reason could be that people were not attracted to live in the east end of RMOC while westend was still supposed to be a preferrable location. Another reason was that the amount and quality of services in that area were not very attractive. But as was the case with L.U.G.I., the L.R.G.I. also depicts a sharp rise during 1974 to 1975. There has been the maximum residential growth during this period increasing from 119.1 in 1974, to 131.6 in 1975. There were many housing projects going on in different areas of the Township. Orleans sewage project was completed in 1974, and many more municipal services were being provided by the developers and the Township. Due to inflation, housing prices were going up in other preferred Townships such as Nepean and March, whereas Gloucester Township was still providing cheaper housing. The cost of similar house was much less in Gloucester in comparison to March. Moreover, there were incentives not only from the developers but also from Federal and Provincial Governments in the form of grants to first time homebuyers. Therefore, more people were choosing Gloucester as their residence. All these factors contributed towards the rapid residential growth during this period. But the rate slowed down a little during 1975 and 1976, perhaps because housing construction was going faster than the actual demand.

The L.C.G.I. shows an opposite trend from L.R.G.I. - a decline in 1971-72 and an increase in 1972 to 1974, which is quite normal. It indicates that the industrial and commercial growth follows residential growth. To fulfill the needs of the residential community, commercial centres are established. People prefer to work near the place of residence and similarly industrial establishments are located where

manpower is available. Therefore, after residential growth in 1971-1972, commercial and industrial growth started from 1972 onwards. Until 1974, it was growing at a moderate pace when suddenly during 1974-1975, the growth rate increased to a maximum - three times more than it was in previous years. The main point is that during this period there was an all over growth in the Township. Secondly, there was great potential for growth in the Township and a study [7] to support planned development in Gloucester Township in 1972, recommended commercial and industrial development. Therefore, the rate of commercial and industrial growth is faster than the residential growth and in comparison to all the three types of growth, commercial growth shows the maximum rise. It is important to note that L.U.G.I. is not the mean of L.R.G.I. and L.C.G.I. but the total of both.

All the factors discussed above, jointly contributed towards this rapid urban growth in the Township of Gloucester which is still continuing.

4.2.2. INDEXED EXPENDITURE ON MUNICIPAL SERVICES:

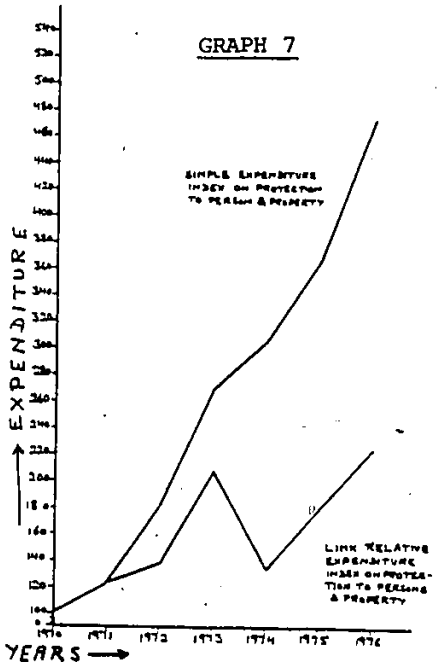
Here the aim is to study the amount of expenditure on each type of municipal service in the Township of Gloucester over the period of study. First, the expenditure on each service is presented on separate graphs and then the indexes of all the five categories of services are presented in one graph (see Graph numbers 7 to 13). These graphs also represent both types of indexes - Simple Index and Link Relative Index. These indexes of expenditure are shown in Table 4-2.

TABLE 4-2

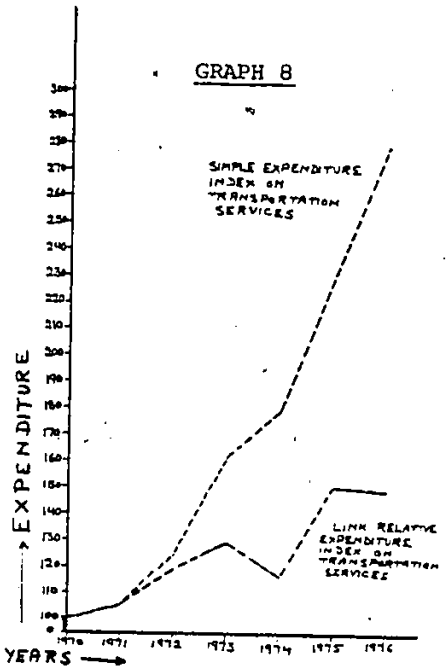
INDEX FOR EXPENDITURE ON MUNICIPAL SERVICES

YEAR →	TYPE OF SERVICES ↓	1970	1971	1972	1973	1974	1975	1976
LINK RELATIVE INDEX (LI)	PROTECTION TO PERSON & PROPERTY	100.0	123.9	138.6	188.4	136.5	161.4	205.4
	TRANSPORTATION	100.0	105.7	119.4	129.3	116.9	151.5	148.8
	ENVIRONMENTAL	100.0	114.4	117.9	142.1	77.2	182.0	139.3
	RECREATION & CULTURAL	100.0	207.5	278.8	348.2	176.8	651.7	396.7
	PLANNING & DEVELOPMENT	100.0	20.8	424.0	19.0	263.5	217.6	903.0
	ALL COMBINED	100.0	114.5	215.7	165.4	154.2	272.8	358.6
SIMPLE INDEX (SI)	PROTECTION TO PERSON & PROPERTY	100.0	123.9	162.5	250.9	287.4	348.3	454.3
	TRANSPORTATION	100.0	105.7	125.0	162.6	179.5	231.0	279.8
	ENVIRONMENTAL	100.0	114.4	102.4	105.8	103.9	110.5	113.7
	RECREATION & CULTURAL	100.0	207.5	386.3	628.2	705.0	1256.7	1584.4
	PLANNING & DEVELOPMENT	100.0	20.8	344.8	263.8	427.3	544.9	1347.9
	ALL COMBINED	100.0	114.5	224.2	282.3	340.6	498.3	756.0

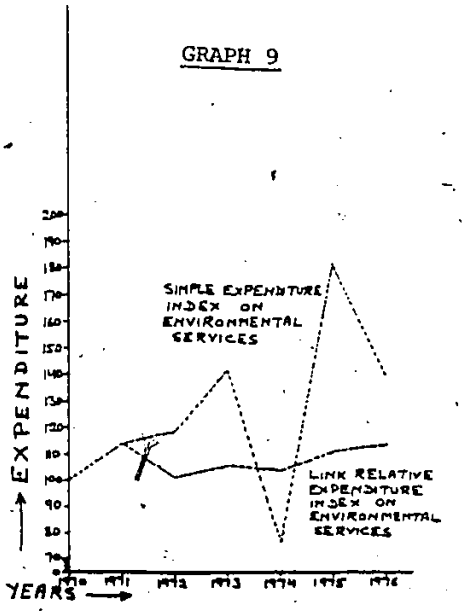
GRAPH 7



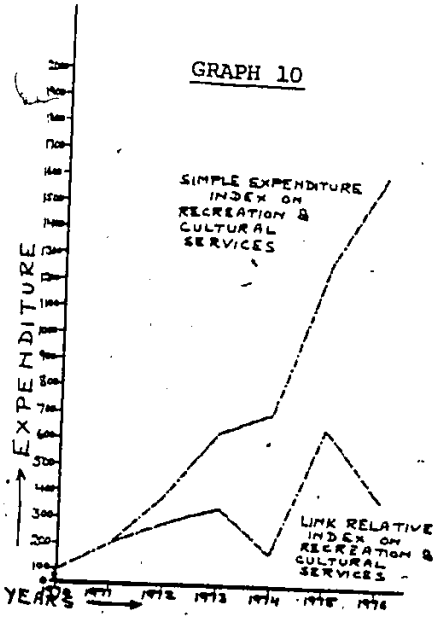
GRAPH 8



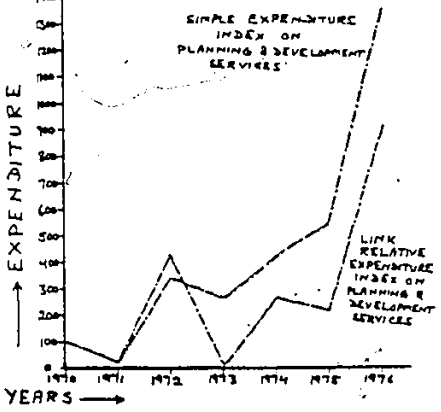
GRAPH 9



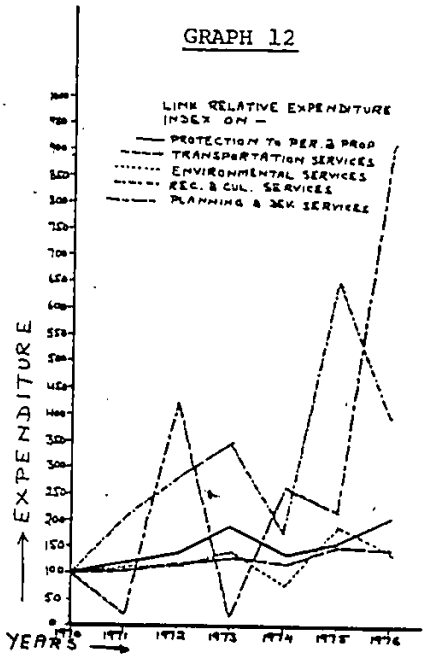
GRAPH 10



GRAPH 11



GRAPH 12



The Township of Gloucester provides a wide variety of services under the category of Protection to persons and property. It has full time staff for fire-fighting, it operates its police department, provides emergency telephone listings and conducts protective inspections of properties and premises within its boundaries. Graph 7 shows the total expenditure on all these services. During 1971 and 1972, there was some increase in expenditure which is normal in the light of rising costs, inflation and more growth. But in 1973, there is a sharp increase in expenditure - more than three times that of the previous year. The reason is that in 1973, the Township expended its services and had a full time fire-fighting staff. During that period, the crime rate was greatest in the Township compared to other municipalities in the Region,

thus giving rise to police costs and for the same reason, rapid increases occurred on other protective services.

In 1974, the current expenditure on these services decreased substantially, mainly because the new services provided in 1973 were sufficient for 1974 as well, and the expenditure in 1974 was on maintenance costs. Another reason was that provincial grants for the police department in 1974 represented 21 percent of Gloucester's total budget. From 1974 to 1976, there is again a rapid increase in expenditure and the trend is still going up. The reason is obvious - due to such a rapid growth during this period, the Township had to provide more services for the protection of persons and property.

The responsibility for roadways is divided between the Regional Municipality and the Township. Graph 8 represents the Township's share which includes responsibility for local residential streets and collector roads, road improvement and maintenance, the construction and maintenance of sidewalks and snow removal. The expenditure on transportation services also shows the same trend as in previous service. The costs increase continuously every year from 1971 to 1973 when suddenly it decreased during 1973-1974. The reason for this could be that up to 1973, the Township was spending on both the maintenance and the new services. But in 1974, OC Transpo increased and improved its services substantially, added new routes and provided transportation to more people. Therefore, the Township's expenditure decreased.

During 1974-1975, the expenditure shot up again because the Township spent less money during the previous year and also because of the sprawling urban growth more roads were built, the cost of maintenance increased and more new services with better quality were required.

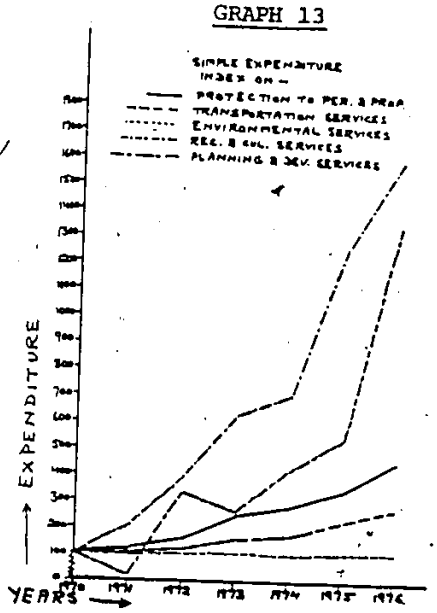
During 1975-1976, though the relative amount (L.I.) of expenditure on transportation services was little less than the previous year, yet the simple index (S.I.) expenditure curve shows that the costs are still going up. Besides growth and new and improved services, another reason for this increase is that a deficit arising from the 1974 operation of the Ottawa-Carleton Regional Transit Commission was being paid by the area municipalities including the Township of Gloucester.

Graph 9 depicts that the expenditures on environmental services were going up during the period 1970-1973. But in 1974, there is a substantial decline in expenditure. It seems that during this year, the Township did not provide new services and the expenditure was mainly towards the maintenance costs. Then again, there is a significant increase in 1975.

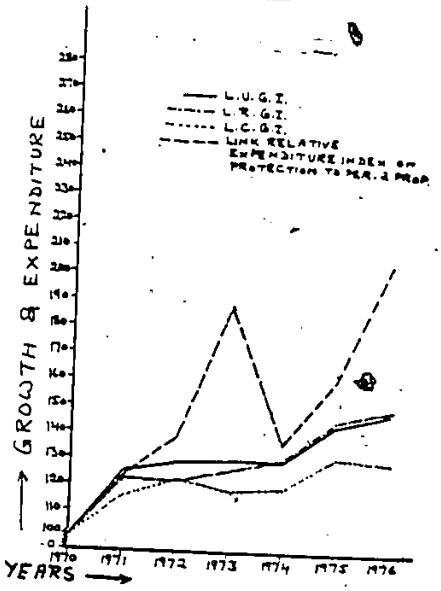
Gloucester Township provides a wide range of indoor and outdoor recreational facilities. It has delegated a great deal of administrative responsibility for recreation programs to citizen groups or recreation associations[8]. The Township also provides community centres and public libraries. Graph 10 shows a continuous increase in the expenditure on these services and a substantial increase from 1974 onwards, which is still going up.

With respect to the planning and development services, the Township spent very little money in 1971. But in 1972, there was a tremendous increase in the expenditure - more than twenty times from 20.8 (in 1971) to 424. The reason being that the Township was spending money on official plans for different areas or on their amendments.

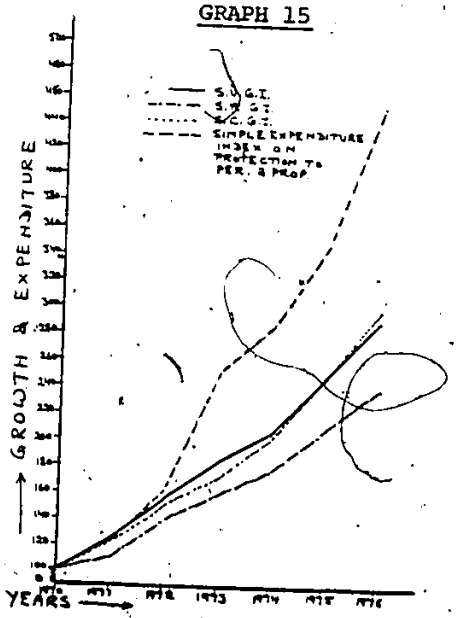
GRAPH 13



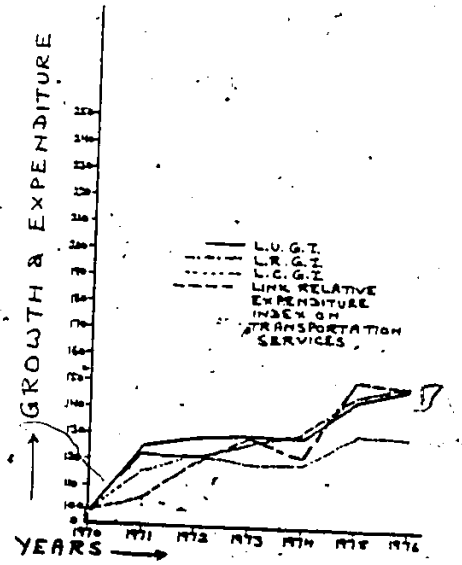
GRAPH 14



GRAPH 15



GRAPH 16



While comparing the expenditure indexes on all the five categories of services over the period of this study, it is interesting to note that in the case of the first three categories of services (i.e. protection of persons and property, transportation services and environmental services), the indexes do not show a very large increase or decrease in the amount of yearly expenditure whereas, the indexes on recreation and dultural services and planning and development services do show very substantial differences in the amount of expenditure from one year to another. Even the trend of expenditure is different in these two services. The first four categories of services show an increase in the expenditure from 1970 to 1973, then the expenses start going down in 1973, and increasing up again from 1974 onwards. The services in the category of planning and development depict a different pattern but still showing an increase in expenditure from 1974. Which means that from 1975 the expenditures on all the municipal services have gone up.

4.2.3 THE IMPACT OF GROWTH ON MUNICIPAL EXPENDITURE:

We have already discussed the pattern of urban growth and the trend of expenditure on municipal services in the Township of

Gloucester over the period of the study. Now we will try to find out as to how does this growth affect the expenditure on individual services.

As mentioned in Section I of this chapter, a Multiple Regression Analysis was performed on indexed (L.I.) growth and indexed (L.I.) expenditure variables. Expenditure variables were taken as dependent variables whereas growth variables were used as independent variables. A correlation within growth variables and within expenditure variables is shown in Tables 4-3 and 4-4 respectively.

Table 4-5 shows the correlation between growth (independent) variables and expenditure (dependent) variables. Table 4-6 shows the correlation between all the variables. The expenditure on different services with respect to different types of growth has been depicted on graphs 14 to 25. These graphs and the correlation coefficients confirm the same trend. Table 4-5 is an important table. It shows that the independent (growth) variables are not correlated which means that our model is good - there is no multi-colinearity.

4.2.3.1. Correlation Coefficients:

The correlation coefficients in the above-mentioned tables show a high relationship between the growth variables and the expenditure variables which indicates that the expenditure on different municipal services depends on the amount of growth. Out of all the growth variables, two - total revenue and number of industrial and commercial establishments, have a very significant relationship, .05% to .001% with the expenditure on different services. This means that in comparison to residential growth, industrial and commercial growth has more influeance on the expenditure, which is quite true. After the Hardy

TABLE 4-3

CORRELATION BETWEEN GROWTH VARIABLES

VARIABLE	TOT POP	TOT REV	N HOUSE		URB RD ML	LUGI	LRGI	LCGI
TOT POP	1.00							
TOT REV	0.40	1.00						
N HOUSE	0.16	0.35	1.00					
N IND COM	0.49	0.90	0.65	1.00				
URB RD ML	0.34	0.02	0.45	0.08	1.00			
LUGI	0.53	0.93	0.63	0.99	0.19	1.00		
LRGI	0.55	0.92	0.62	0.94	0.32	0.98	1.00	
LCGI	0.56	0.96	0.47	0.97	0.40	0.98	0.95	1.00

TABLE 4-4

CORRELATION BETWEEN EXPENDITURE VARIABLES

VARIABLE	PROT PER	TRANS	ENVIRON	REC CUL	PLAN DEV	ALL SER
PROT PER	1.00					
TRANS	0.84	1.00				
ENVIRON	0.58	0.79	1.00			
REC CUL	0.63	0.91	0.93	1.00		
PLAN DEV	0.55	0.56	0.12	0.25	1.00	
ALL SER	0.78	0.90	0.60	0.72	0.85	1.00

TABLE 4-5

CORRELATION BETWEEN GROWTH (INDEP.) VARIABLES AND EXPENDITURE (DEP.) VARIABLES

VARIABLE	TOT POP	TOT REV	N HOUSE	N IND COM	URB RD ML	LUGI	LRGI	LCGI
PROT PER	0.03	0.78	0.63	0.87	-0.19	0.82	0.75	0.80
TRANS	0.20	0.98	0.41	0.86	-0.01	0.89	0.88	0.90
ENVIRON	-0.09	0.71	0.41	0.54	0.09	0.60	0.64	0.57
REC CUL	0.21	0.88	0.37	0.71	0.15	0.78	0.82	0.77
PLAN DEV	0.16	0.58	0.28	0.61	0.12	0.59	0.55	0.59
ALL SER	0.19	0.89	0.43	0.83	0.13	0.85	0.84	0.84

TABLE 4-6

CORRELATION AMONG ALL THE VARIABLES

VAR	TOT POP	TOT REV	NO HOUSE	NO IND COM	URB RD ML	PROT PER	TRANS	ENVIRON	REC CUL	PLAN DEV	ALL SER	LUGI	LRGI	LCGI	TIME
TOT POP	1.00														
TOT REV	0.40	1.00													
NO HOUSE	0.16	0.35	1.00												
NO IND COM	0.49	0.90	0.65	1.00											
URB RD ML	0.34	0.02	0.45	0.08	1.00										
PROT PER	0.03	0.78	0.63	0.87	0.19	1.00									
TRANS	0.21	0.98	0.41	0.86	-0.01	0.84	1.00								
ENVIRON	-0.09	0.71	0.41	0.54	0.10	0.58	0.79	1.00							
REC CUL	0.21	0.88	0.37	0.71	0.15	0.63	0.91	0.93	1.00						
PLAN DEV	0.15	0.58	0.28	0.61	0.12	0.55	0.56	0.13	0.25	1.00					
ALL SER	0.19	0.89	0.43	0.83	0.13	0.78	0.90	0.60	0.72	0.85	1.00				
LUGI	0.53	0.93	0.63	0.99	0.19	0.82	0.89	0.60	0.78	0.59	0.85	1.00			
LRGI	0.55	0.92	0.62	0.94	0.32	0.75	0.88	0.64	0.82	0.55	0.84	0.98	1.00		
LCGI	0.56	0.96	0.47	0.97	0.40	0.79	0.90	0.57	0.77	0.59	0.84	0.98	0.95	1.00	
TIME	0.44	0.95	0.31	0.91	0.12	0.81	0.91	0.49	0.71	0.66	0.86	0.91	0.87	0.95	1.00

Report in 1972, the Township knew that there is tremendous potential for industrial and commercial growth. If we compare the expenditure on different services with respect to different types of growth, we find that the results are quite reasonable.

The correlation between residential growth and expenditure on protection to persons and property is 0.75. A 't' test (see Table 4-7) shows the value 2.19 which is significant at 0.01 level. Whereas the correlation between commercial and industrial growth and this service is a bit higher (0.80) but significant only at 0.05 level. This indicates that the increase in the expenditure on the protection to persons and property is more closely related to industrial and commercial growth than to residential growth. It is quite obvious that there are more chances of crimes, fire, accidents, etc., in industries than in the residential areas.

Similarly transportation is a main requirement for industrial establishments and therefore, there is a very high correlation of 0.90 - significant at 0.01 level, between the expenditure on transportation services and the industrial and commercial growth. With respect to residential growth it is 0.88 significant at 0.02 level. Thus, we can say that there is a direct relationship between urban spatial growth and the expenditure on transportation services. With the increase in growth, the expenditure on these services also increases. But this increase is more significantly affected by industrial and commercial growth than by residential growth.

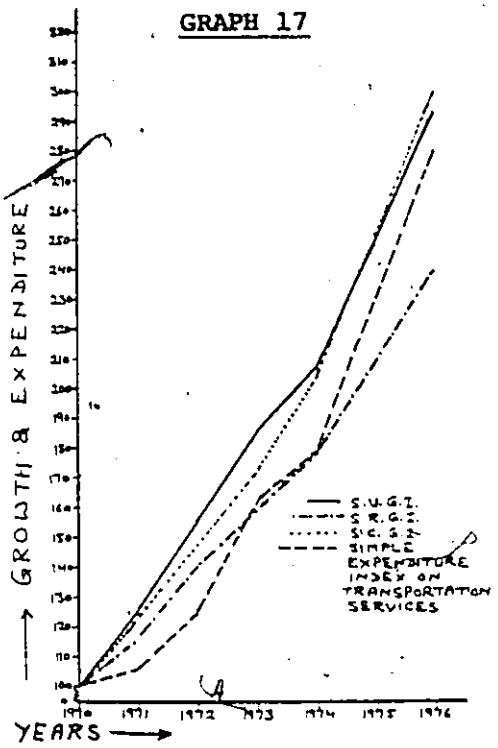
In the case of recreation and cultural services, the increment in expenditure is influenced by the amount of growth to a great extent. But these services are more directly related to residential growth than

TABLE 4-7

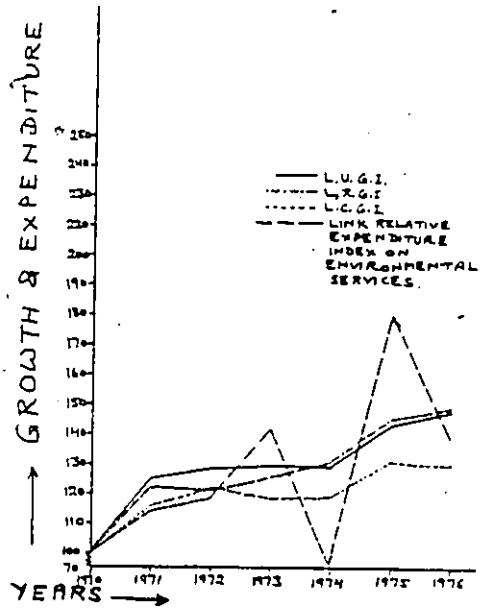
t - Test

.70	t = 2.19	5DF = 2.02 at p = 0.1 p'= 90%
.75	t = 2.52	
.80	t = 2.98	5DF = 2.57 at p = 0.05 p'= 95%
.85	t = 3.58	5DF = 3.37 at p = 0.02 p'= 98%
.89	t = 4.36	5DF = 4.03 at p = 0.01 p'= 99%
.90	t = 4.61	
.95	t = 6.80	5DF = 6.68 at p = 0.001 p'= 99%
.96	t = 7.66	5DF = 6.68 at p = 0.001 p'= 99%

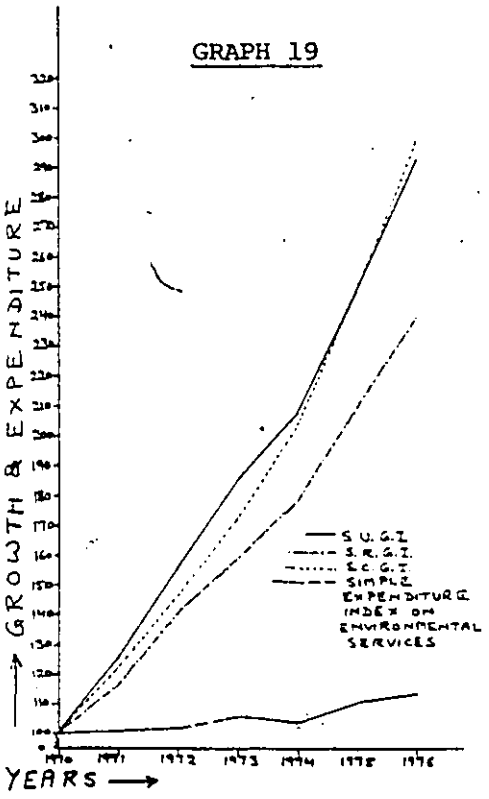
GRAPH 17



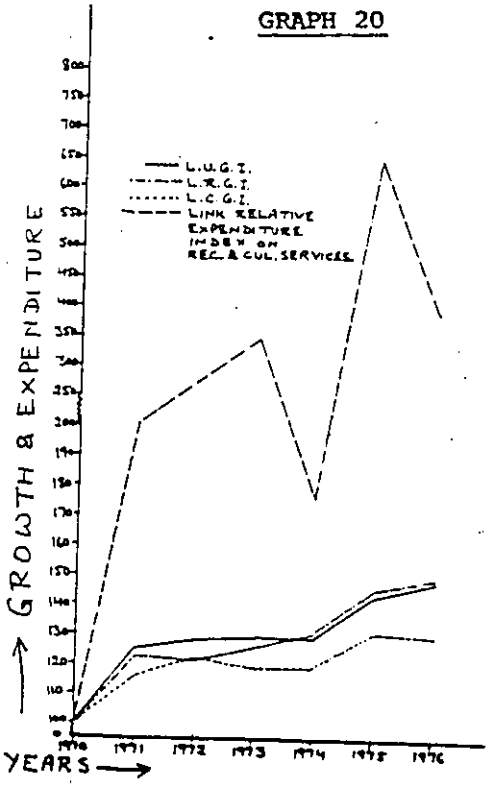
GRAPH 18



GRAPH 19



GRAPH 20

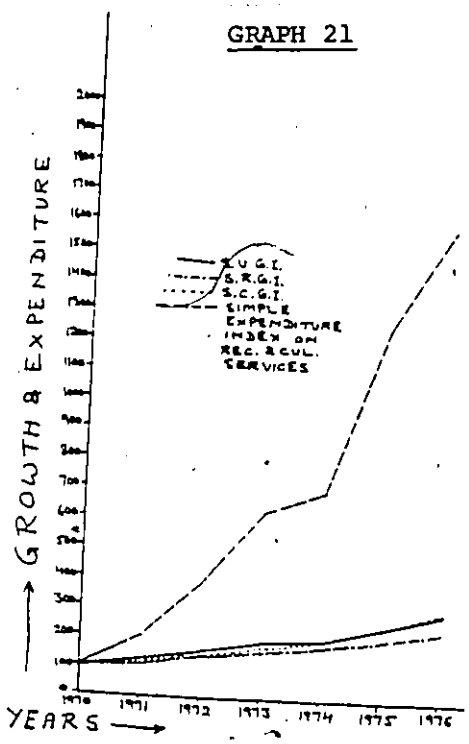


to industrial and commercial growth. There is more demand for parks, playgrounds, arenas and other recreational services in residential communities than in industrial areas. Therefore, the correlation between these services and residential growth is higher (0.82) than between these services and industrial and commercial growth (0.77). In comparison with other services, the amount of expenditure on this service is much higher. The reason for this could be given that in the case of other services, lots of grants are available and also a big portion of responsibility is shared by the Regional Municipality of Ottawa-Carleton whereas the costs on recreation and cultural services are mostly Township's own responsibility. After 1974, when the Township started growing rapidly, the need was felt for more and more recreation and cultural services. Therefore, during the period of 1974-1975, there was the maximum expenditure on these services (651.7).

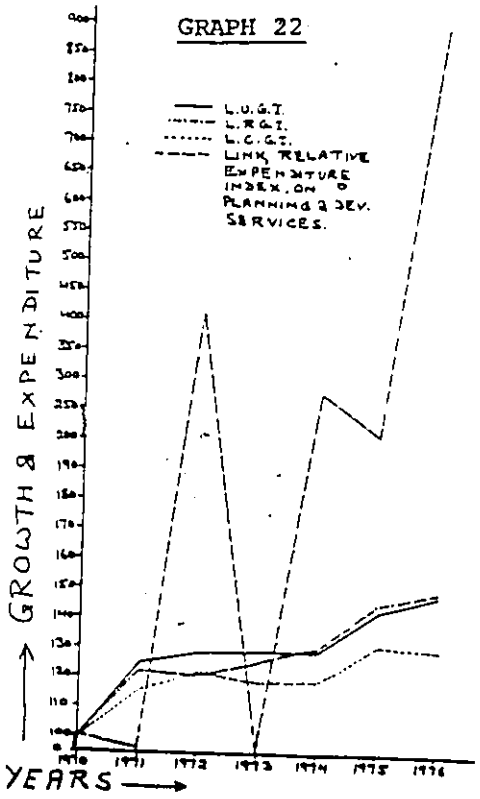
Though the correlation between the expenditure on environmental services and the urban spatial growth is not very high yet the graph (18) shows that the increase or decrease in growth affects the expenditure on these services. When there is rapid growth, the Township has to spend more money, not only on maintenance but also towards providing new services. But when the growth slowed down a little during the year 1975-1976, the expenditure on these services also declined, which indicates that the expenditure during that period, mostly covered the maintenance costs on already existing services and not on providing new services.

With respect to planning and development services, the situation is somewhat different. The correlation between expenditure and growth is not very high and even the graph (22) does not reveal a significant

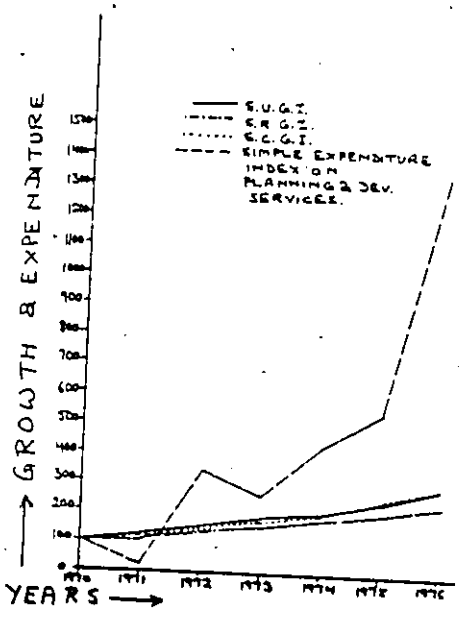
GRAPH 21



GRAPH 22



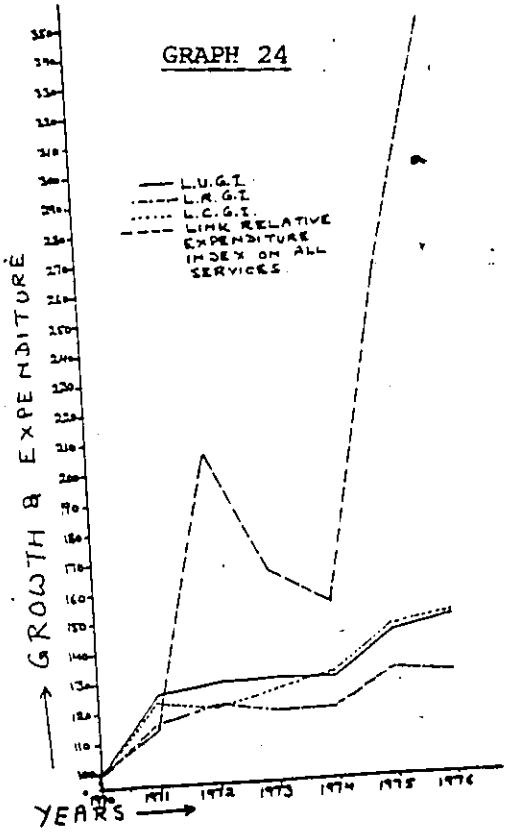
GRAPH 23



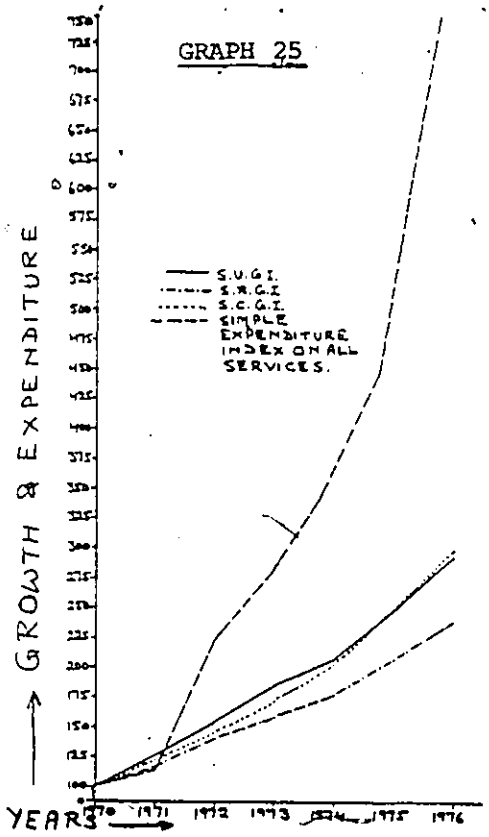
relationship. In other words, the relationship between the expenditure on planning and development and urban spatial growth is not always in the same direction. In the beginning, growth follows planning and subsequently, with the increase in growth more expenditure on planning is needed. Graph 22 shows the same pattern. We see that during 1971-1972, the Township spent a substantial amount on planning and development because the urban spatial growth had already started there and they wanted to have planned development. In the following year, though the amount of growth was still going up, there was a sharp decrease in the expenditure on these services. After that, in 1973-1974, the expenditure increased again on official plans, zoning and development and then with the rise in the amount of growth, the expenses on these services also increased. It means that the amount of growth does affect the expenditure on planning and development services. With the rapid increase in growth there was more need for proper planning, thus increasing the expenditure on these services which reached to its maximum in 1976.

The correlation between the total expenditure on all services and urban spatial growth is quite high, 0.85, which is significant at 0.02 level. The graph of link relative expenditure index on all services (Graph 24) also shows that with the increase in growth, the expenditure on services also increases. But the increase in the expenditure on services is much higher than the increase in the amount of growth. This shows that urban spatial growth has a great impact on the expenditure on municipal services in the Township of Gloucester. Though the rate of growth during 1975-1976 slows down, yet the increase in expenditure during this period is still very high. It reveals that in the case of some services, the expenditure increases after the growth

GRAPH 24



GRAPH 25



has actually occurred. Because then the expenditure is not only towards providing new services but also towards the maintenance of already existing services. Thus in comparison to the amount of growth, the expenditure on municipal services increases at a very high rate, which explains the increase in both the quantity and quality of services. The total amount of expenditure in 1976 is two and a half times more than the total amount of growth in 1976. The reason for this is that with the inflation and price increase, the new services are costing more money, maintenance costs have also increased and the quality of services is also improving as there is more demand for improved and better quality of services.

Summary Table 4-8 shows the correlation between time and expenditure variables 1 to 6. Here we see that the value of B is positive in the case of each service which indicates that there is a positive relationship between time (independent variable) and expenditure on services (dependent variable). This table shows a positive correlation of .81 between variable 1 and time which is significant at 0.05 level, indicating that variable 1 is a function of time. In other words, expenditure on protection to persons and property is directly related to time. As time goes on, the amount of growth increases bringing a rise in the expenditure on that service. The correlation between variable 2 and time is very high .91, significant at 0.01 level. As the Township grows over time, more and more transportation services are required costing more money. The expenditure on recreation and cultural services (var. 4) is also significantly related with time at 0.1 level. But variables 3 and 5 do not show a very significant relationship which means that time does not affect the expenditure on environmental services

TABLE 4-8

S U M M A R Y T A B L E

NO.	DEPENDENT VARIABLE	CONSTANT	INDEP. VAR. TIME B COEFFICIENT	CORRELATION COEFFICIENT (r)	SIGNIFICANCE
1	PROTPER	-27267	13.90	.81	0.05
2	TRANS	-16470	8.41	.91	0.01
3	ENVIRON	-14842	7.58	.49	x
4	RECCUL	-117825	59.87	.71	0.1
5	PLANDEV	-185895	94.36	.66	x
6	ALLSER	-72444	36.82	.86	0.02

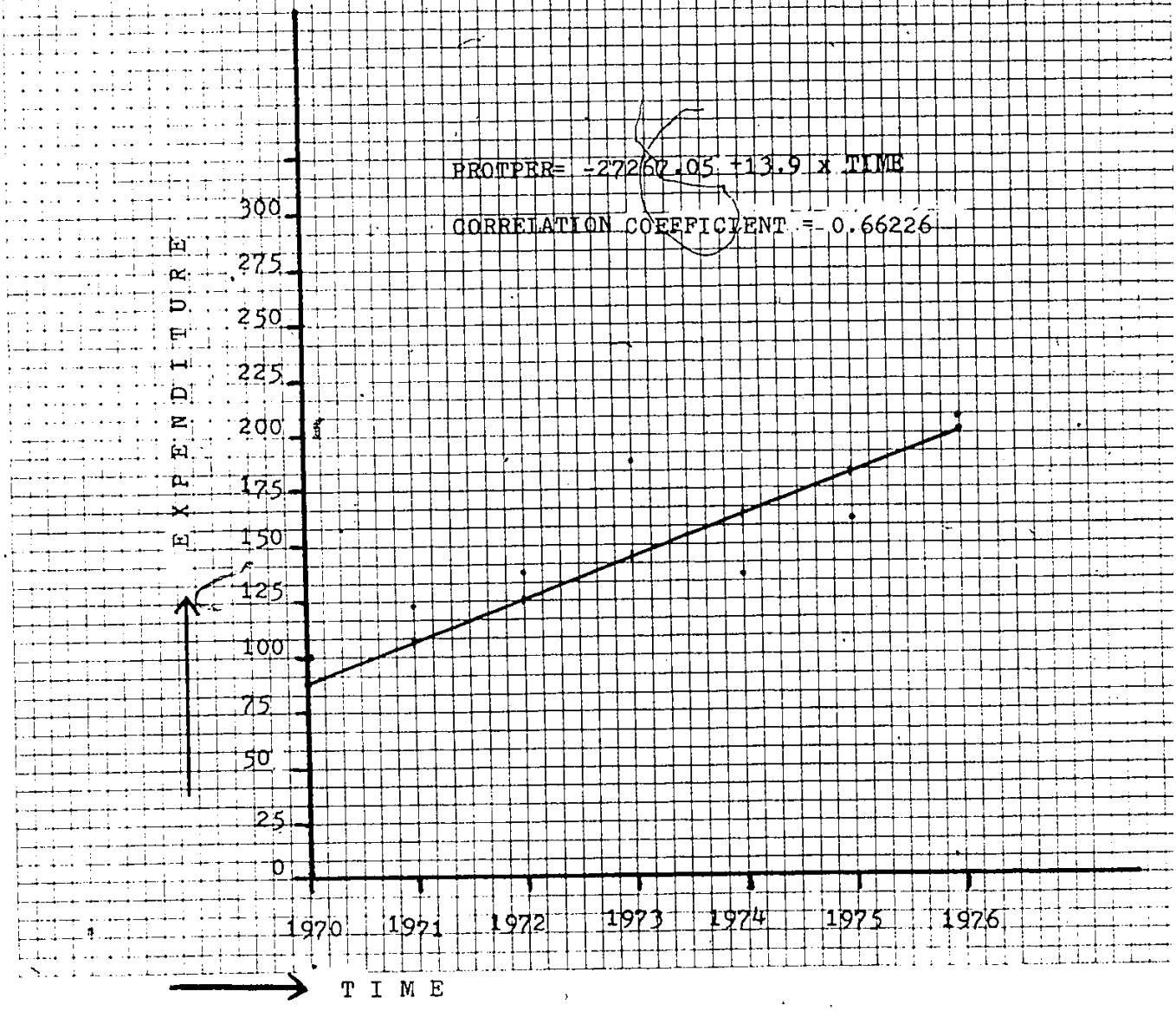
and planning and development services to the same extent as it affects the expenditure on other services. However, the relationship between the total of all the services and time is very high and significant at 0.02 level indicating that the expenditure on municipal services is a function of time. As the time passes, expenditure also increases.

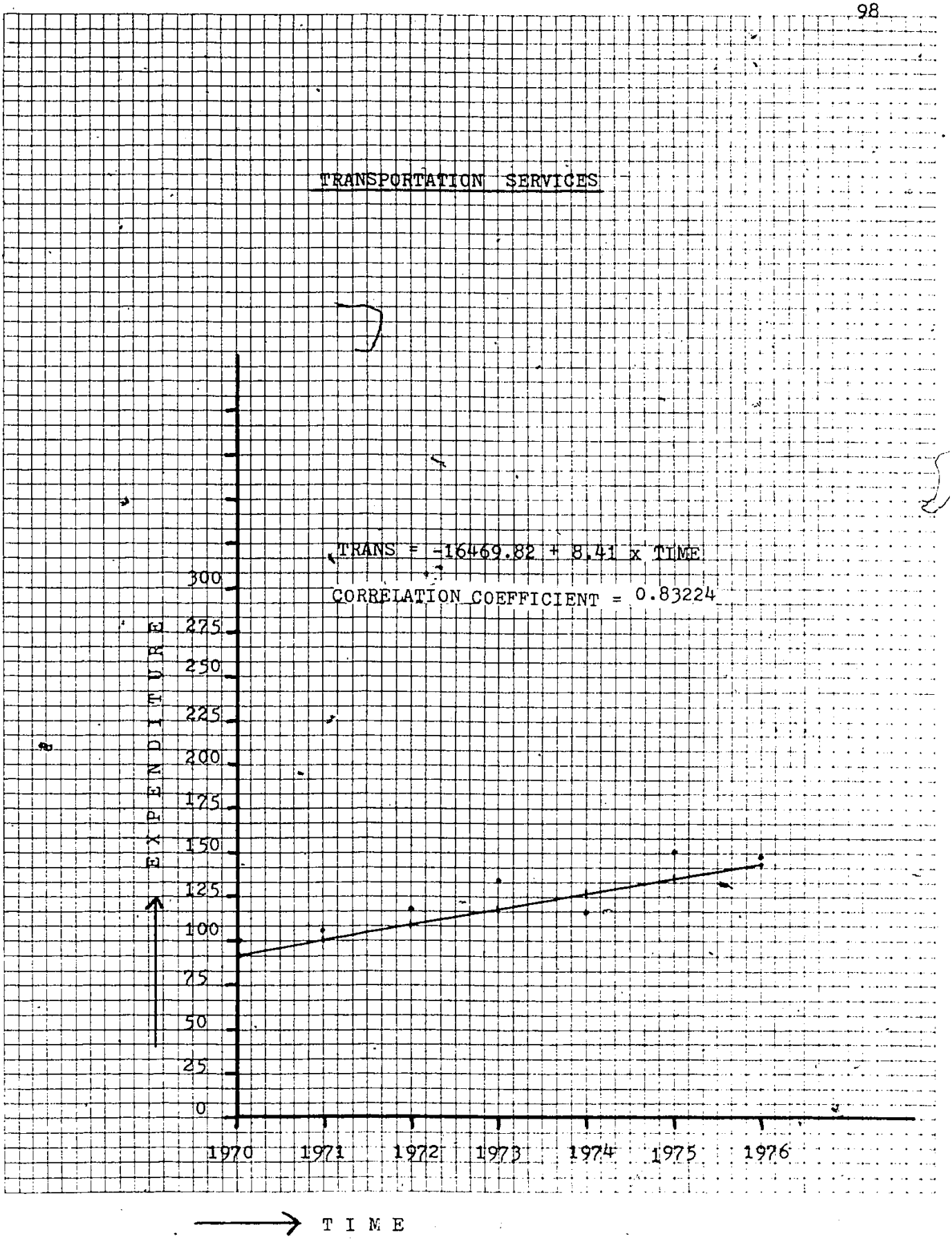
These results are confirmed by Regression Lines drawn on Graph 26 on the basis of specific models of equations for each expenditure variable (See Table 4-9). Regression lines of all the services indicate an upward trend. Summary Table also shows a marginal rate of change in B coefficients.

Thus, in conclusion it can be stated that there is a positive correlation between urban spatial growth and the expenditure on different municipal services with respect to time. The Township of Gloucester has proved itself to be a good model for the purposes of predicting the trend. Though the data set were small, yet it provided significant results. Multiple regression concluded the same trend or results as were obtained by Indexed Trend Analysis. Therefore, it can be predicted that all types of urban spatial growth - be it residential, commercial or industrial - has a substantial impact on the provision of municipal services in the Township of Gloucester. As the amount of growth will increase with time, the expenditure on services shall also increase.

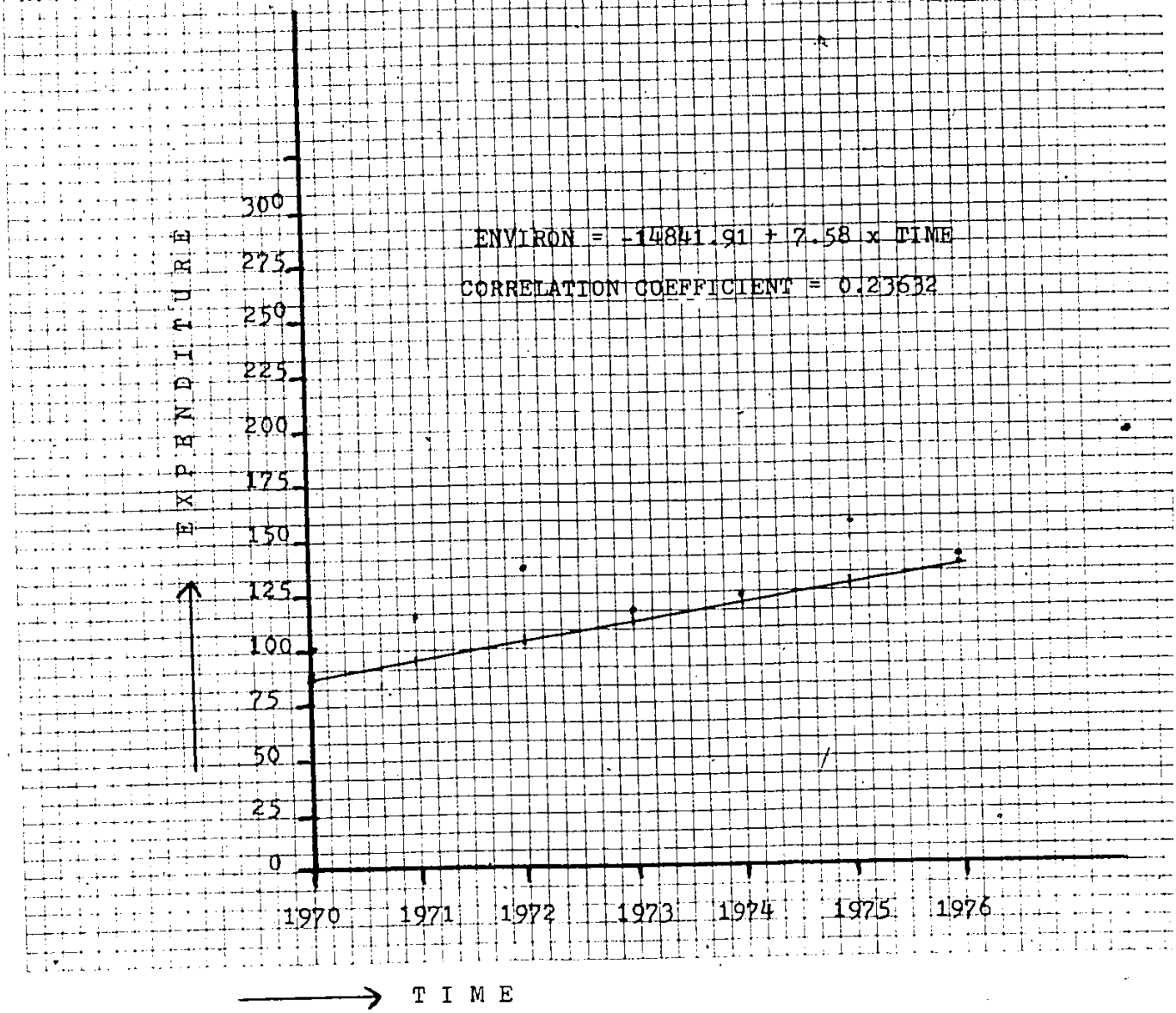
REGRESSION LINES

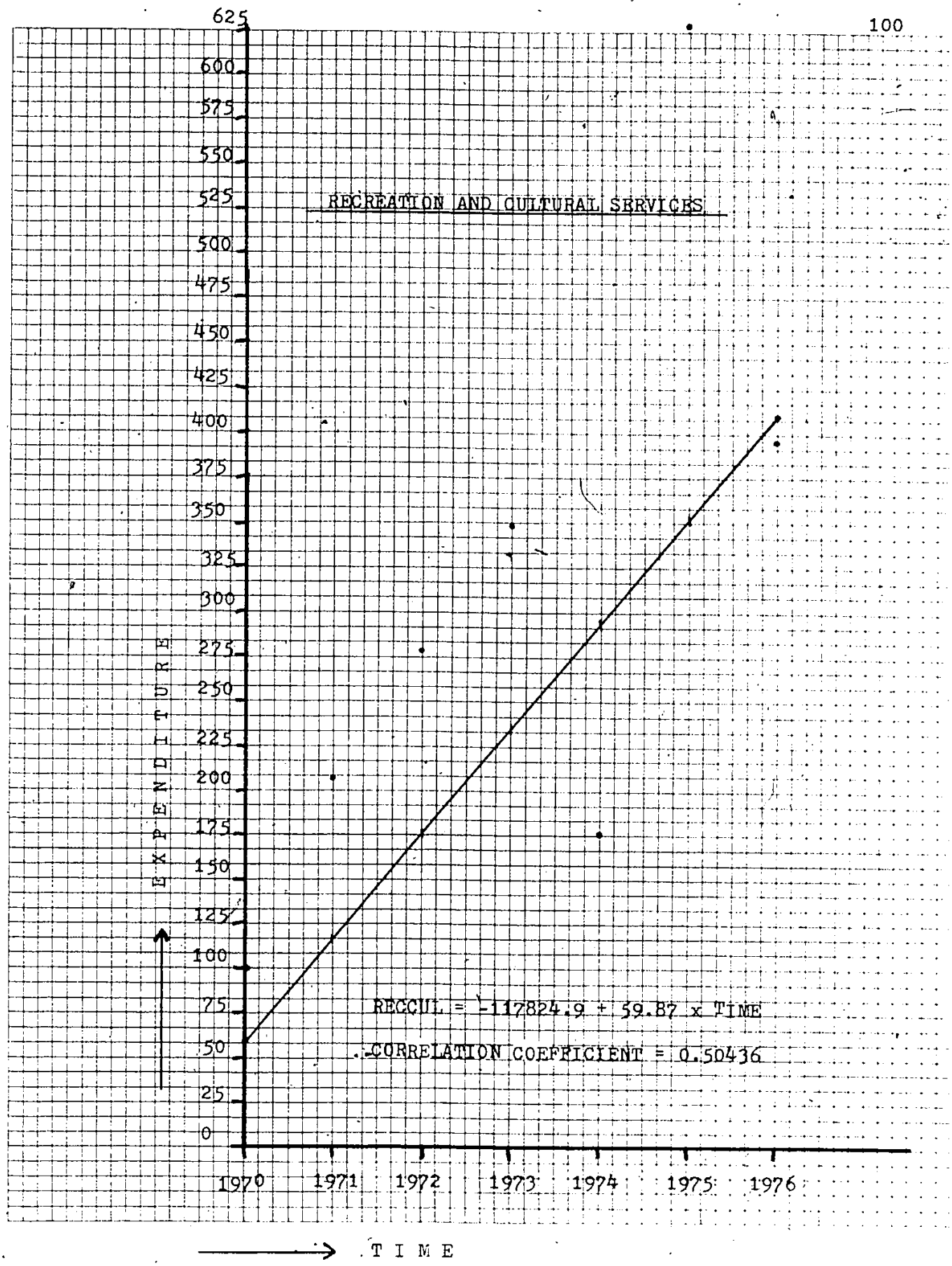
PROTECTION TO PERSON AND PROPERTY

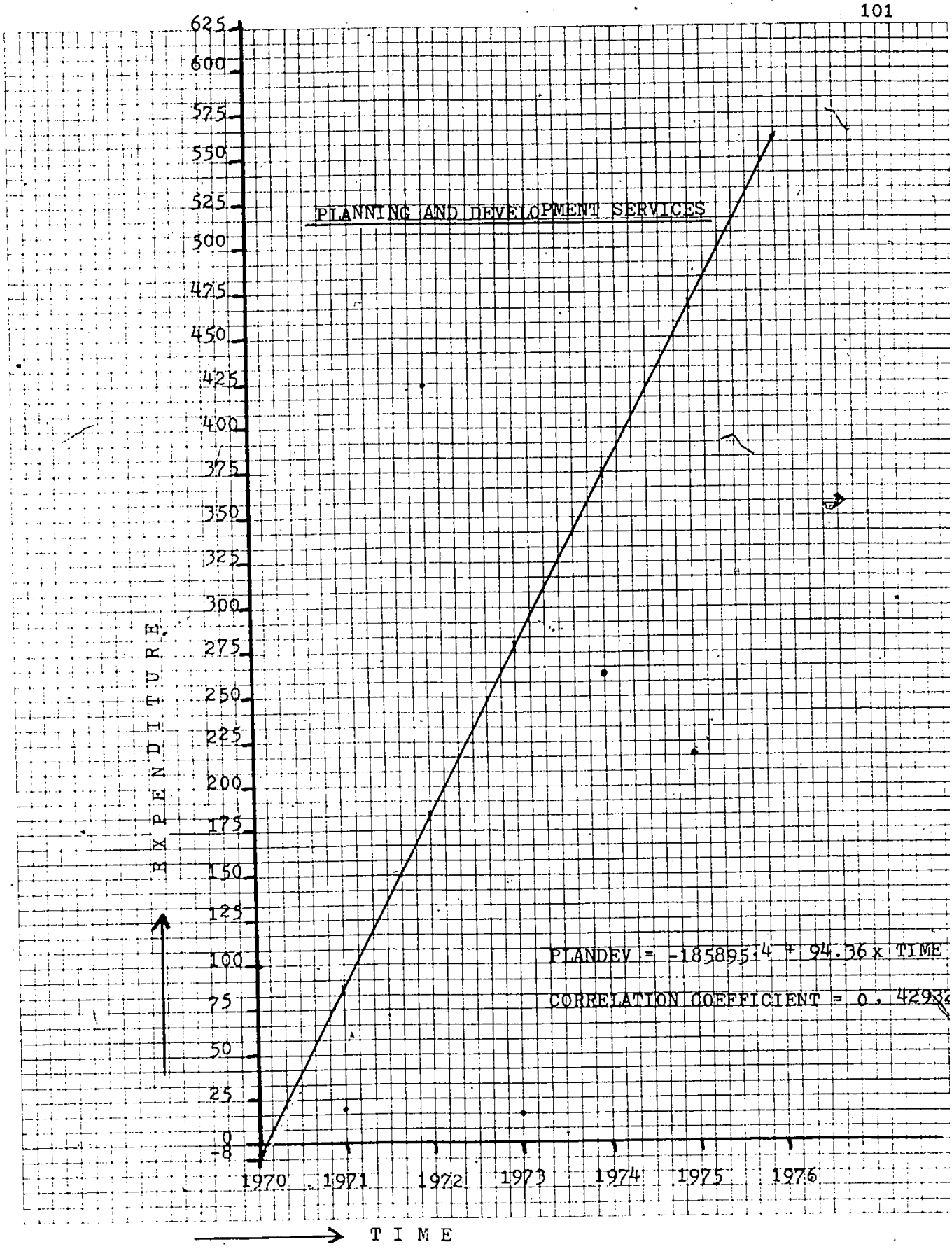



TRANSPORTATION SERVICES
TRANS = -16469.82 + 8.41 x TIME
CORRELATION COEFFICIENT = 0.83224
EXPENDITURE
300
275
250
225
200
175
150
125
100
75
50
25
0
1970
1971
1972
1973
1974
1975
1976
TIME

ENVIORONMENTAL SERVICES




100
625
600
575
550
525
500
475
450
425
400
375
350
325
300
275
250
225
200
175
150
125
100
75
50
25
0
RECREATION AND CULTURAL SERVICES
EXPENDITURE
RECCUL = -117824.9 + 59.87 x TIME
CORRELATION COEFFICIENT = 0.50436
1970
1971
1972
1973
1974
1975
1976
TIME


PLANNING AND DEVELOPMENT SERVICES
625
600
575
550
525
500
475
450
425
400
375
350
325
300
275
250
225
200
175
150
125
100
75
50
25
0
-8
EXPENDITURE
1970
1971
1972
1973
1974
1975
1976
TIME
PLANDEV = -185895.4 + 94.36 x TIME
CORRELATION COEFFICIENT = 0.4293

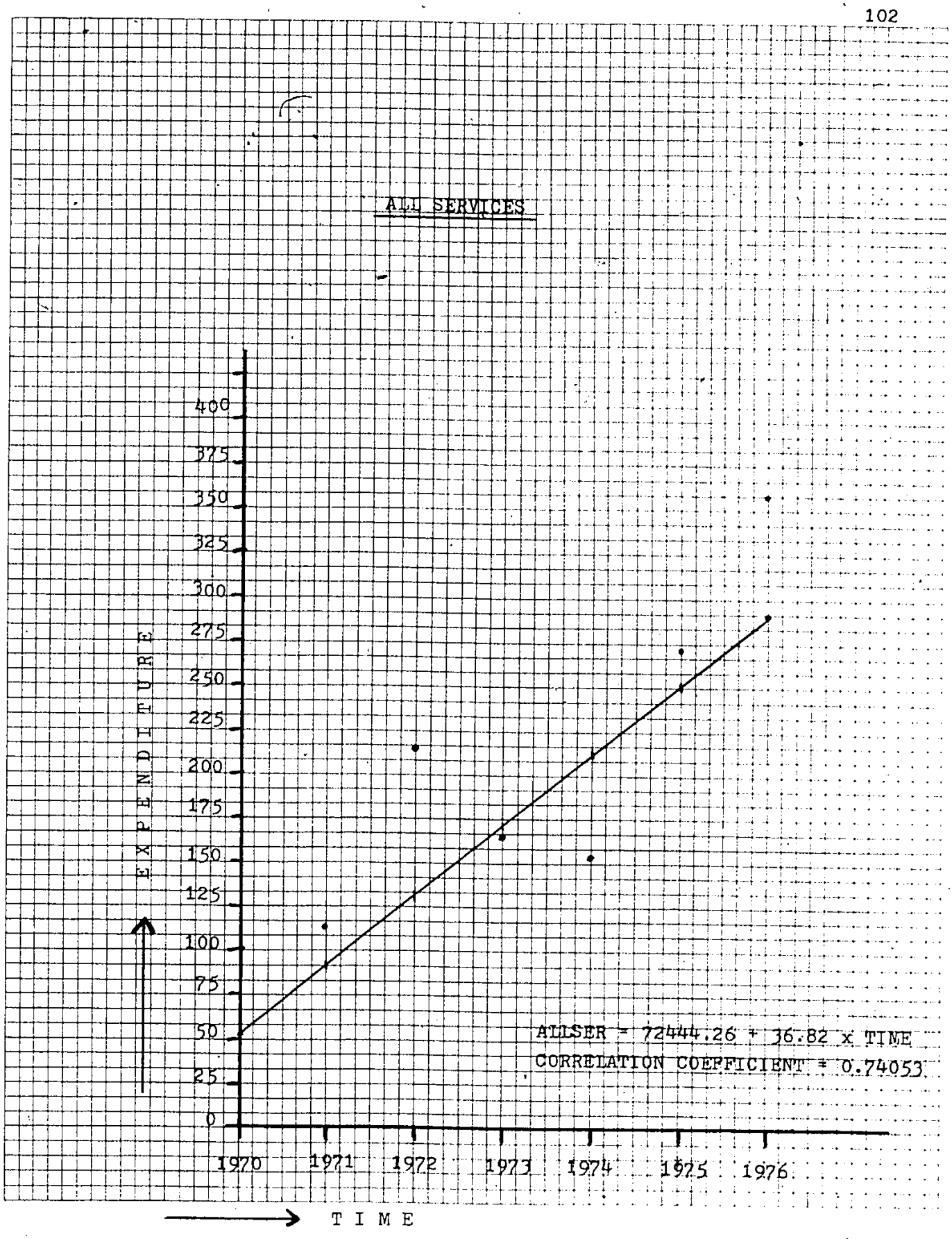

ALL SERVICES
EXPENDITURE
400
375
350
325
300
275
250
225
200
175
150
125
100
75
50
25
0
1970
1971
1972
1973
1974
1975
1976
TIME
ALLSER = 72444.26 + 36.82 x TIME
CORRELATION COEFFICIENT = 0.74053

TABLE 4-9

SPECIFIC MODELS OF EQUATIONS

$Y = A + Bx$

PROTPER	=	$Y = -27267.05 + 13.89643 \times 1970$	= 108.9
		$Y = -27267.05 + 13.89643 \times 1976$	= 192.3
TRANS	=	$Y = -16469.82 + 8.410713 \times 1970$	= 99.3
		$Y = -16469.82 + 8.410713 \times 1976$	= 149.75
ENVIRON	=	$Y = -14841.91 + 7.585714 \times 1970$	= 101.95
		$Y = -14841.91 + 7.585714 \times 1976$	= 147.46
RECCUL	=	$Y = -117824.9 + 59.875 \times 1970$	= 108.85
		$Y = -117824.9 + 59.875 \times 1976$	= 488.1
PLANDEV	=	$Y = -185895.4 + 94.361 \times 1970$	= 4.8
		$Y = -185895.4 + 94.361 \times 1976$	= 561.36
ALLSER	=	$Y = -72444.26 + 36.818 \times 1970$	= 86.86
		$Y = -72444.26 + 36.818 \times 1976$	= 307.77

WHERE: -

Dependent Variable = Expenditure on Services
Independent Variable = Time

X = Year
A = Constant or Intercept
B = B Coefficient of Time

FOOTNOTES

1. Hammond, R. & McCullagh, P.S.: "Quantitave Techniques in Geography: An Introduction", Clarendon Press, Oxford, (1975) p. 1.
2. Speigal, Murray R.: Schaum's Outline Series, "Theory and Problems of Statistics", McGraw Hill Book Company, (1961) pp. 313-317.
3. Bureau of Municipal Research: "Legislative Attempts to Control Urban Growth in Canada", Civic Affairs, Toronto, (November, 1976), p. 5.
4. Hammond and McCullagh, op. cit. pp. 241-269.
5. Kim, Jae-On; Kohout, Frank J., University of Iowa, "Multiple Regression Analysis: Subprogram Regression" in Statistical Package for the Social Sciences (SPSS), McGraw Hill Book Company, Toronto (1975) pp. 321.
6. SPSS, op. cit. pp. 323.
7. Eric Hardy Consulting Limited: "Financial Consequences for the Township of Gloucester of Alternative Forms of Urban Development", Ottawa, (1972).
8. Mayo, H.B.: "Report of the Ottawa-Carleton Review Commission", Ministry of Treasury, Economics and Intergovernmental Affairs, (TEIGA), Eastern Ontario Region, Ottawa (October, 1976) pp. 154.
9. Gloucester Township: "Submission to the Ottawa-Carleton Review Commission", (March, 1976) p. 42.

CHAPTER 5

CONCLUSION

Based on the analysis in Chapter 4 the following conclusions are made:

1. Residential growth does not pay for itself - it needs more expensive services and generates less income.
2. Commercial and industrial growth are less expensive and yield more revenue to the township.
3. There is unbalanced ratio of residential and commercial growth in the Township of Gloucester. The statutory ideal ratio is 60/40 whereas in the Township of Gloucester it is 82/18. Therefore, for economically balanced and viable municipal services, more commercial and industrial growth is needed.

A growing municipality is required to increase certain of its expenditures as an immediate and direct response to urban growth. For example, the cost of producing a voters list will increase directly with the growth of the voting population. The cost of sending out tax bills will vary according to the number or fragmentation of properties to be taxed. Other more significant increases in expenditure can and frequently are delayed in whole or in part. For a temporary period, a police or fire department may endeavor to cope with an increase in population without adding either manpower or equipment. Of course, the quality of protection will be bound to suffer if expansion is long

delayed. Again, a municipality may fail to add new parklands until the deficiency of available parks becomes glaring. Such delays in adjusting the level of services may have the effect of concealing part of the cost of urban expansion within the municipality. At other times, increases in expenditures may seem unwarranted because they result from a backlog of immediate service needs, not an immediate increase in requirements. In our analysis, we have assumed a gradual and steady expansion of expenditures in response to fresh urban growth, although we are fully aware of the fact that service expansions are more likely to come in surges than in such a well-paced fashion.

When housing is brand new, it results in the most favorable cost-revenue position for the municipality. We should recognize, therefore, that this theoretical data respecting new housing puts the best face on the financial consequences of obtaining such housing. As the years pass, assessed values, converted to constant dollars must be expected to show a steady though slow decline. A second point is that as residential neighborhoods grow older, the cost of urban servicing will increase because the Township of Gloucester, as common with other urbanizing municipalities, requires the land developer to meet the full cost of service installations to high standards, to dedicate land for park or other purposes, and to pay a substantial cash impost besides. When the cash has run out and the services require some maintenance or renewal, the level of expenditures will go up without providing any fresh service benefit to the resident population. A third, equally important point is that the Township of Gloucester, which is struggling to deliver services under conditions of extremely rapid growth, is saving money because it cannot

keep up with the service requirements. The library services and the park system provide two striking examples of the Township's situation. When services catch up with requirements, the cost-benefit position of residential development will worsen somewhat. In order to avoid this type of situation being created, the Township is encouraging development of condominiums which are like small municipalities in the way they provide certain services. The owner pays a specific fee for services (such as garbage and snow removal) rendered by the condominium, and also pays taxes to the municipal government for the same services which he does not receive. Thus, in a way condominium development generates more income for the municipality requiring less expenditure on services. But,

> "condominium developments are often high density forms of housing. Consequently, a given acreage of condominium row houses or apartments, for example, can benefit a municipality by producing higher property taxes than a similar development of lower density, semi-detached and single family houses. Yet this increased revenue to the municipality is not necessarily matched by increased municipal services to condominiums. At the same time, various municipal governments are concerned that condominium developments do not necessarily come up to general municipal standards for such things as roads and street lighting".[1]

This could pose problems in the future should municipalities ever have to assume responsibility for providing common services.

Indeed, as argued earlier, the most desirable financial position would be realized by a municipality in which urban growth is entirely commercial or industrial of the highest quality. If the Township of Gloucester could pick and choose, the best new urban development it could obtain would be distilleries! On the revenue side, their tax yield is almost three times that of residential or farm properties of

equivalent value. On the expenditure side, the windowless buildings in which alcoholic beverages are stored for aging helps limit their overall demand for municipal services. But if Gloucester cannot fill up its territory with distilleries, which it cannot, it also cannot opt out meanwhile from municipal service requirements and from the necessity of taxing its existing types of properties to pay for them. The Township of Gloucester is in fact an operating municipality with an on-going financial position that is considerably below average. It could obtain new urban growth that produces a cost-benefit result somewhat below average and still improve its financial position. It would do so if the cost-benefit consequences of new development were better than the cost-benefit position of those existing uses that were displaced.

Thus, from the financial viewpoint, commercial and industrial growth constitutes the preferred form of urban growth by a considerable margin. Between commercial and industrial, the greater benefit will accrue on the average from commercial. An interrelationship exists between all forms of business properties and urban residential properties. Industrial areas, wholesaling or warehousing establishments and office accommodation all constitute places of work for urban-oriented residential dwellers. Therefore, special attention by the planning of the Township of Gloucester may be given to the analysis of the retail outlets for goods and services that are required to serve the planned population in order to ensure that land is reserved in the best possible locations for these purposes.

In approving residential development, preference should be accorded to a developer who is prepared to take some initiative on the inclusion of suitable commercial properties within his development. Even inclusion of a few small shops as part of a medium or high-rise apartment development will accrue to the Township's financial advantage.

Turning to industrial development, we note first that the Township of Gloucester's potential to attract industry is circumscribed first by the limitations that apply to the entire Ottawa area and secondly by the peripheral location of Gloucester within the Ottawa Metropolitan Area. For this reason among others, the Township of Gloucester's efforts to attract industry have included recognition of rural industrial use zones where industries requiring outdoor storage of materials and products can be accommodated. The most successful industrial park area owned and developed by the Township has been of this character. Its latest acquisition of land for industrial park purposes will not offer piped water and sewer services.

Gloucester's attitude towards new urban growth, therefore, could be to preplan its moves with the objective of securing desirable forms of urban use which at the same time, bring some improvement in the financial operating position of the municipality.

FOOTNOTE

1. Thomson, J. and Harrison, P. "Condominiums in Canada": Ten Years of Growing Pains, Vol. 21, No. 2 (1978) p. 53.

APPENDIX 'A'

TABLE 1

DETERMINANTS OF URBAN GROWTH

YEAR	TOTAL POPULATION	TOTAL REVENUE (in dollars)	REVENUE FROM RESIDENTIAL SOURCES	REVENUE FROM COMMERCIAL AND INDUSTRIAL SOURCES	NUMBER OF HOUSING UNITS	NUMBER OF COMMERCIAL AND INDUSTRIAL ESTABLISHMENTS	NEW URBAN ROAD MILEAGE
1970	31992	3660436	2827071	833365	1637	48	11.7
1971	36940	4360163	3461092	899071	1572	53	7.0
1972	40551	5528093	4631113	896980	1850	54	26.0
1973	41818	6991852	5912627	1079225	1808	66	0.0
1974	48089	8499440	7170058	1329382	653	61	2.4
1975	53322	11638784	9766296	1872488	1071	81	6.5
1976	56741	14550532	12166722	2383810	1659	104	1.9

Total Houses in 1970
8600 - 1572 = 7028

Total No. of Industrial and Commercial Units in 1970
550 - 467 = 83
(1976)

Total Urban Road Mileage in 1970
137.8 + 11.7 = 149.5 miles

TABLE 2

LINK RELATIVE CHANGE IN DETERMINANTS OF URBAN GROWTH IN EACH YEAR

YEAR	TOTAL POPULATION	TOTAL REVENUE (in dollars)	REVENUE FROM RESIDENTIAL SOURCES	REVENUE FROM COMMERCIAL AND INDUSTRIAL SOURCES	NUMBER OF HOUSING UNITS	NUMBER OF COMMERCIAL AND INDUSTRIAL ESTABLISHMENTS	NEW URBAN ROAD MILEAGE
1970	base	base	base	base	base	base	base
1971	4948	699727	634021	65706	1572	53	7.0
1972	3610	1167930	1170021	2091	1850	54	26.0
1973	1287	1463759	1281514	182245	1800	66	0.0
1974	6671	1507588	1257031	250157	653	61	2.4
1975	4843	3139348	2596238	543106	1071	81	6.5
1976	3419	2911768	2400026	511322	1659	104	1.9
				YEAR 1970 BASE VALUES			
1970	31992	3660436	2827071	833365	7028	83	149.5

TABLE 3

LINK RELATIVE INDEX (L.I.) OF DETERMINANTS OF URBAN GROWTH

YEAR	TOTAL POPULATION	TOTAL REVENUE (in dollars)	REVENUE FROM RESIDENTIAL SOURCES	REVENUE FROM COMMERCIAL AND INDUSTRIAL SOURCES	NUMBER OF HOUSING UNITS	NUMBER OF COMMERCIAL AND INDUSTRIAL ESTABLISHMENTS	NEW URBAN ROAD MILEAGE
1970	100	100	100	100	100	100	100
1971	115.5	119.1	122.4	107.9	122.4	163.8	104.7
1972	111.3	131.9	141.4	99.75	126.3	165.1	110.7
1973	104.0	140.0	145.8	121.9	125.7	179.5	100.00
1974	120.9	141.2	144.5	130.0	109.3	173.5	101.6
1975	115.1	185.8	191.8	165.2	115.2	197.6	104.4
1976	110.7	179.5	184.9	161.4	123.6	225.3	101.3

TABLE 4

LINK RELATIVE INDEX (L.I.) OF URBAN GROWTH

YEAR	L.U.G.I.	L.R.G.I.	L.C.G.I.
1970	100.0	100.0	100.0
1971	125.1	116.3	123.0
1972	129.1	122.4	121.7
1973	129.8	118.8	126.4
1974	129.3	119.1	131.5
1975	143.6	131.6	145.6
1976	148.1	130.1	149.7

TABLE 7

SIMPLE INDEX (S.I.)OF URBAN GROWTH

YEAR	S.U.G.I.	S.R.G.I.	S.C.G.I.
1970	100.0	100.0	100.0
1971	125.1	116.3	123.0
1972	155.5	140.4	146.4
1973	185.3	159.1	172.7
1974	207.4	178.2	204.2
1975	248.0	209.8	249.7
1976	293.3	239.9	299.4

TABLE 5

SIMPLE CHANGE IN DETERMINATS OF URBAN GROWTH IN EACH YEAR

OVER 1970 VALUES

YEAR	TOTAL POPULATION	TOTAL REVENUE (in dollars)	REVENUE FROM RESIDENTIAL SOURCES	REVENUE FROM COMMERCIAL AND INDUSTRIAL SOURCES	NUMBER OF HOUSING UNITS	NUMBER OF COMMERCIAL AND INDUSTRIAL ESTABLISHMENTS	NEW URBAN ROAD MILEAGE
1970	base	base	base	base	base	base	base
1971	4948	699727	634021	65706	1572	53	7.0
1972	8559	1867657	1804042	63615	3422	107	33.0
1973	9826	3331416	3085556	245860	5230	173	33.0
1974	16497	3509622	4342987	496017	5883	234	35.4
1975	21330	6105860	6939225	1039123	6954	315	41.9
1976	24749	8506286	93339651	1550445	8613	419	43.8

YEAR 1970 BASE VALUES

1970	31992	3660436	2827071	833365	7028	83	149.5

TABLE 6

SIMPLE INDEX (S.I.) OF DETERMINANTS OF URBAN GROWTH

YEAR	TOTAL POPULATION	TOTAL REVENUE (in dollars)	REVENUE FROM RESIDENTIAL SOURCES	REVENUE FROM COMMERCIAL AND INDUSTRIAL SOURCES	NUMBER OF HOUSING UNITS	NUMBER OF COMMERCIAL AND INDUSTRIAL ESTABLISHMENTS	NEW URBAN ROAD MILEAGE
1970	100	100	100	100	100	100	100
1971	115.5	119.1	122.4	107.9	122.4	163.9	104.7
1972	126.8	151.0	163.8	107.6	148.7	228.9	122.1
1973	130.7	191.0	209.1	129.5	174.4	308.4	122.1
1974	151.6	195.9	253.6	159.5	183.7	381.9	123.7
1975	166.7	266.8	345.5	224.7	198.9	479.5	128.0
1976	177.8	332.8	430.0	286.0	222.6	604.8	129.3

TABLE 8

EXPENDITURE ON MUNICIPAL SERVICES

YEAR	PROTECTION TO PERSON & PROPERTY	TRANSPORTATION SERVICES	ENVIRONMENTAL SERVICES	RECREATION & CULTURAL SERVICES	PLANNING & DEVELOPMENT SERVICES	TOTAL OF ALL SERVICES
1970	754901	723200	345671	171147	89077	2083996
1971	935451	764163	385100	355183	18562	2458459
1972	1226761	904398	446826	661136	307174	3546295
1973	1894208	1175936	592302	1075128	235008	4972562
1974	2169589	1297970	513544	1206588	380635	5568326
1975	2632796	1670175	797142	2150825	485391	7736329
1976	3429871	2023312	933041	2711629	1200644	10298497

TABLE 9

LINK RELATIVE CHANGE IN EXPENDITURE ON MUNICIPAL SERVICES IN EACH YEAR

YEAR	PROTECTION TO PERSON & PROPERTY	TRANSPORTATION SERVICES	ENVIRONMENTAL SERVICES	RECREATION & CULTURAL SERVICES	PLANNING & DEVELOPMENT SERVICES	TOTAL OF ALL SERVICES
1970	Base	Base	Base	Base	Base	Base
1971	180550	40963	39429	184036	-70515	74893
1972	291310	140235	61726	305953	288612	217567
1973	667447	211538	145476	413992	-72166	273257
1974	275381	122030	-78758	131460	145627	119148
1975	463207	372205	283598	944237	104756	433600
1976	797075	353137	135889	507804	715253	501831
			YEAR 1970 BASE VALUES			
1970	754901	723200	345671	171147	89077	2083996

TABLE 10

LINK RELATIVE INDEX (LI) OF EXPENDITURE ON MUNICIPAL SERVICES

YEAR	PROTECTION TO PERSON & PROPERTY	TRANSPORTATION SERVICES	ENVIRONMENTAL SERVICES	RECREATION & CULTURAL SERVICES	PLANNING & DEVELOPMENT SERVICES	TOTAL OF ALL SERVICES
1970	100	100	100	100	100	100
1971	123.9	105.7	114.4	207.5	20.8	114.5
1972	138.6	119.4	117.9	278.8	424.0	215.7
1973	188.4	129.3	142.1	348.2	19.0	165.4
1974	136.5	116.9	77.2	176.8	263.5	154.2
1975	161.4	151.5	182.0	651.7	217.6	272.8
1976	205.4	148.8	139.3	396.7	903.0	358.6

TABLE 11

SIMPLE CHANGE IN EXPENDITURE ON MUNICIPAL SERVICES IN EACH YEAR OVER 1970 VALUES

YEAR	PROTECTION TO PERSON & PROPERTY	TRANSPORTATION SERVICES	ENVIRONMENTAL SERVICES	RECREATION & CULTURAL SERVICES	PLANNING & DEVELOPMENT SERVICES	TOTAL OF ALL SERVICES
1970	Base	Base	Base	Base	Base	Base
1971	180550	40963	39429	184036	-70515	74893
1972	471860	181198	101155	489989	218097	292460
1973	1139307	452736	246631	903981	145931	577717
1974	1414688	574770	167873	1035441	291558	696866
1975	187895	946975	451471	1979678	396314	792466
1976	2674970	1300112	587370	2540482	1111567	1642900

YEAR 1970 BASE VALUES

1970	754901	723200	345671	171147	69077	2083996

TABLE 12

SIMPLE INDEX (S.I.) OF EXPENDITURE ON MUNICIPAL SERVICES

YEAR	PROTECTION TO PERSON & PROPERTY	TRANSPORTATION SERVICES	ENVIRONMENTAL SERVICES	RECREATION & CULTURAL SERVICES	PLANNING & DEVELOPMENT SERVICES	TOTAL OF ALL SERVICES
1970	100	100	100	100	100	100
1971	123.9	105.7	100.9	207.5	20.8	114.5
1972	162.5	125.0	102.4	386.3	344.8	224.2
1973	250.9	162.6	105.8	628.2	283.8	282.3
1974	287.4	179.5	103.9	705.0	427.3	340.6
1975	348.3	231.0	110.5	1256.7	544.9	498.3
1976	458.3	279.6	113.7	1584.4	1347.9	756.0

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