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TRENDS IN LOCAL AUTHORITY INFRASTRUCTURE EXPENDITURE:

AN INVESTIGATION OF URBAN AREAS IN NEW ZEALAND

1946 to 1971

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ABSTRACT

The pattern of Local Authority expenditure on infrastructure provision is examined for urban areas of 5000 plus in New Zealand, for the post-war period. Infrastructure is divided into two major categories, Economic Overhead Capital (EOC) and Social Overhead Capital (SOC), under which a number of components have been placed. The use of mean per capita for both actual and real expenditure for five year periods has been used, rather than examining expenditure on a yearly basis. This enabled a leveling out of fluctuations in expenditure.

Examination of expenditure is divided into two major areas of concern. Firstly, infrastructure expenditure is analysed in respect to the categories of EOC and SOC for: towns within different population size groupings; population density groupings; and a North Island - South Island comparison of urban areas of similar size. Secondly, infrastructure expenditure of both EOC and SOC combined is analysed for: urban areas within regions at different stages of economic development; metropolitan areas compared with; a) other regional centres within a certain radius and b) towns within different population size groupings; and for a regional urban system, using the Taranaki region as a case study.

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Chapter 1

INFRASTRUCTURE AND URBAN GROWTH

Discussions of urban geography have normally included some mention of infrastructure, but have rarely gone any further in explaining its importance. It is commonly argued that many urban areas grow at a fast rate, and as a consequence of this, so do associated urban problems. Likewise it is commonly argued that these problems can be overcome by the introduction of new or additional infrastructure, to enable relatively even growth and alleviate monetary burdens. It is surprising therefore, that studies of the determinants of such outlays have been so few throughout the world.

The purpose of this thesis is to study infrastructure provision within the New Zealand urban system.⁽¹⁾ Hypotheses are developed covering the major groups of causal factors affecting community infrastructure investment. These centre on broad demographic characteristics of the urban areas. Studies of this nature have not been undertaken with respect to the New Zealand urban system, so it is therefore not known what level of infrastructure outlay occurs within different sized urban entities and between different regions.

Although there is both private and public investment in infrastructure, the study will look at the public sector only; that is, the investments made by both central and local government. The general measure used throughout the study for each component of infrastructure is outlays per capita. The study investigates infrastructure provision at the inter-regional and inter-urban level as well as the intra-regional and intra-urban levels, giving a wide treatment of different aspects of infrastructure in the New Zealand national urban system.

(1) Only towns with population of 5000 plus are studied.

PUBLIC GOODS AND SERVICES.

Public goods and services (i.e. public infrastructure) have been defined as 'goods or services that can be consumed by many individuals simultaneously, where one persons consumption does not detract from others, and where exclusion of potential consumers is not feasible' (Bish and Nourse, 1975, 116).

The notion of public goods and services is also applicable when considering economic activity for industry. More and more importance has been attached, especially from an industrial perspective, to amenity factors in the location of firms as well as an increasing degree of dependence of particular industries on various services locally supplied by other industries, institutions and public bodies. Thus the external economies of a location well supplied with services and goods has become one of the major determinants in firm location. The provision of good housing, recreational areas, utility systems, transportation facilities and networks are all thought of as a necessary basis for the development of profitable enterprises.

When studying public infrastructure, which can be stated as public overhead capital (OC), it is convenient to divide the different goods and services into two components, 'social' overhead capital (SOC), and 'economic' overhead capital, (EOC). Thus OC can be stated as a combination of EOC and SOC. The use of SOC and EOC components helps in the analysis of the main causes of variability in per capita municipality investment.

The public investments classified as EOC include transport provision and roading, commerce (banking), government institutions, and public utilities which include water supply, electricity and gas supply, drainage and sewerage systems. Those classified as SOC include education amenities: primary, secondary and tertiary institutions; health facilities: hospitals and welfare homes; and social facilities: parks, libraries, zoos, museums; public housing and personal collective

security: police and fire services.

The items that are classified EOC are

primarily orientated toward the support of directly productive activities or toward the movement of economic goods. The SOC items on the other hand are less concerned with the provision of satisfactions which have generally been regarded as "non-economic" in nature. Although SOC may also increase productivity, the way in which it does so is much less direct than is the case for EOC items (Hansen, 1965, 151).

Another difference between SOC and EOC is that private consumers tend to be willing to move away from their place of residence to benefit from SOC facilities in other parts of the community or in other communities. This is true for such items as playgrounds, museums, schools, libraries and so on. However for EOC facilities, consumers generally prefer these to be in close proximity to their places of work and residence. This is true for roads, electricity and water supply and sewerage systems. Therefore it is commonly argued that both municipalities and firms tend to provide EOC facilities before those having the characteristics of SOC.

URBAN GROWTH PROCESS.

Urban growth is a complex process involving a number of inter-related factors such as population change and population density as well as occupational structure. All of these factors either directly or indirectly influence the level of overhead capital outlays. The five stages of the urban growth process put forward by Thompson (1965), provide a theoretical background from which the urban growth process can be studied. The stages of the urban growth process are presented in Table 1 along with the public sector development likely to occur within each stage.

These stages are only broad generalisations against which empirical work might be set. Growth of the local economy may stop

TABLE 1

FOUR STAGES OF URBAN GROWTH PROCESS
ADAPTED FROM THOMPSON

STAGES	ACCOMPANYING STAGES OF PUBLIC SECTOR DEVELOPMENT
<p style="text-align: center;">EXPORT SPECIALISATION</p> <p>Economy linked to one dominant industry.</p>	<p>Lack of sufficient income to provide required services, outside sources needed. Basic services, largely EOC components.</p>
<p style="text-align: center;">EXPORT COMPLEX</p> <p>Towns economic base extended. Local production broadened and/or deepened by extending forward and backward linkages in stages of production.</p>	<p>Extension of basic services. Introduction of sewerage and water systems. Also SOC components introduced.</p>
<p style="text-align: center;">ECONOMIC MATURATION</p> <p>Urban economy moves to self-sufficiency with much broader range of industry.</p>	<p>Linked export industry demand more and better local services. Associated with demand for industry, there is a greater demand for SOC facilities from people within urban area; parks, libraries, health and education facilities etc.,</p>
<p style="text-align: center;">REGIONAL METROPOLIS</p> <p>Local economy becomes node connecting and controlling neighbouring cities; once rivals, now satellites.</p>	<p>Extension of services, both EOC and SOC</p> <p>Possible establishment of most sophisticated and advanced EOC facilities, such as motorways, sewerage treatment etc.,</p>

Source: Adapted from Goodall, 1972, 278-280

or stagnate between any of these stages if momentum at the end of the phase is not strong enough to carry the economy to the point at which the mechanism of the next stage is activated. With these generalisations in mind, we may now study infrastructure as a determinant and as a consequence of growth in the process of urban growth.

INFRASTRUCTURE AS A DETERMINANT OF GROWTH.

As stated by Lane (1966) 'There are two factors in urban economic growth, the permissive and the implemental'⁽²⁾. The former represents the physical ability or capacity of an urban area to grow in terms of, for example, resource availability. Implemental factors must, however, be present for actual growth to take place. These are positive or stimulating conditions relating, for example, to the level of product demand, the cost conditions of production and especially the attitudes of entrepreneurs' (Goodall, 1972, 262-263).

Thus urban growth will occur in the long run because of the acquisition of new or substitute economic activities, i.e. industrial structural change or changing industrial mix. Within the overall economic system, urban growth is largely of an individual nature, as the continued long run growth of any urban area depends on its capacity to invent, innovate or otherwise acquire new export activities. Thus Thompson (1968,9) sees the economic base of the large metropolitan area 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.

(2) There are other corresponding terms - initiating and sustaining used by Allen and Hermansen in EFTA

This statement may also be true at a smaller nation scale and be found in urban areas within New Zealand. To ensure growth in New Zealand urban areas, new industry must replace a dying or stagnating industry. Towns on the West Coast of the South Island are good examples of how a towns growth declines when the area fails to substitute or attract a new activity to replace the dying industry, in this case coal. Exceptions do occur, notably the dormitory settlement, where an industry may have once existed but has declined or stagnated. Due to the settlements advantageous location in space, it has been able to take on the role as a residential dormitory for the larger urban entity, which enables the dormitory settlement to survive and continue to grow even though it maybe lacking major industry (eg. Te Awamutu).

The successful substitution of industry in turn depends on the urban areas acquired advantages, such as size and skill range of the labour force and the variety of it's services and public goods. The more developed these are the more favourable it is for substitution. Growth will be reflected in changing spatial patterns of activity locations, land use intensity and land values.

With urban growth, the urban area grows in population, acquires new functions and expands existing activities, its relationship with its hinterland and with the system of urban areas is altered, its physical area is extended and its internal arrangements undergo change and adjustments.

Obviously the larger urban areas have an advantage, with cheaper more flexible transport systems giving better hinterland connections and more frequent services, a large range of auxiliary and business services offered and moreover the scope of the urban public economy increases in 'breadth' and 'depth' with increasing urban size. It is possible that considerable internal economies are available in the provision of certain public services, such as sewerage disposal, so that

public utility systems are also cheaper and more flexible.

However outward expansion will have repercussions for the internal structure of the urban area. Outward expansion influences the internal structure, as the expansion is only part of the overall urban environment and the peripheral communities that are established must still rely on other parts of the urban area for various facilities and opportunities. Thus existing services are either extended to incorporate the new areas or stretched to their limit and become inefficient or insufficient. For example, one effect of increased specialisation of land use which accompanies urban growth, the establishment of a residential suburban area being a case, is the further separation of residence and workplace, which throws a further burden on public transport and roads at peak hours, as distance to work has been lengthened.

Another aspect of increased specialisation of land is the mass exodus of people from the central area of town to suburbs, leaving those with predominantly low incomes in the central city. This in turn could lead to impoverishment to the central area, since urban service requirements of these slum-like areas are high, whereas their financial contributions are low. These areas create costs for the community by way of declining property values, increased fire and police services, higher public welfare and health costs.

So far urban growth has been discussed in terms of long run, but what are the key factors in the process of urban growth in regards to the short run? Short run growth can be seen as one round of growth, where the urban area increases output of products and services but does not build new plants to do so. Changes in the level of exports or services from an urban area are the major determinants of short run fluctuations in the level of economic activity in that urban area.

Urban areas exist, suffer fluctuations in their level of economic activity, and grow because of economic activities whose locations are

determined ~~erogenously~~^{erogene} to the urban area by that area's comparative advantage in the regional or national economic system. Where an urban area obtains a high degree of specialisation in the production of goods and services it supplies to outsiders, it cannot be self sufficient. Specialisation in economic activity offers an urban area the prospect of maximum growth, but, equally, it may pose the threat of temporary or severe recession, even stagnation or decline.

Therefore urban growth and short term fluctuations in urban economic activity may be viewed as the response of economic activities within an urban area in supplying more goods and services, following an increase in demand from outside the urban area. The demand emphasis indicates the short - run time concern.

In relation to government and urban growth, in any mixed economy, government action will have a considerable influence on the relative opportunities for inter-urban development. Expenditure of government will influence use of resources directly, with as much of this expenditure being on public services catering to the needs of the private sector. From this, indirect or secondary effects will follow, as for instance the large part of social infrastructure of the urban system, which creates external economy opportunities, has been either built or established by government bodies using public funds. The timing and location of this public investment will do much to influence the growth and pattern of development within a nation's urban system.

Input / Output analysis is one way of tracing the importance of the government sector in the urban growth process. Input / Output is essentially a set of simultaneous linear relations, one for each sector, showing the distribution of it's output to the using sectors. Another method of tracing governments importance is by considering the linkage system which describes inter industry connections (Thomas, 1972). Knowledge related to the spatial dimensions of these linkages appears to be critically important if effective governmental

economic planning is to be undertaken. One needs to know the extent to which the investments made by the government benefit other regions.

Non-profit uses are land uses not usually provided by persons working under profit motive and in the urban area this covers a large part of the infrastructure such as roads, utility and welfare services, education, health and so on. Most of these non-profit uses are under public control and finance. The profit uses are dependent upon the existence of the non-profit uses, for without them their profit margin would be greatly reduced, if profit was obtained at all. Therefore the spatial pattern of non-profit use provision is critical to profit making uses. Thus government is in an extremely advantageous position when it comes to influencing the efficiency with which resources are used. By changing the institutional framework and, in particular, the amount and location of non-profit land uses, the government can make alterations to the framework which lead to a more optimal solution to the resource allocation problem. The growth and development of the urban system is therefore likely to take place as a result of a series of public and private decisions, the latter having often been guided, directed, stimulated or even blocked at times, by public controls.

Hirsch sees the role of government as:

providing urbanites with tangible and intangible services --- services as resource using sets of activities whose objective is to satisfy urbanites wants and thus enhance their welfare --- most government services require relatively close geographic proximity of service units to service recipients (Hirsch, 1973, 457).

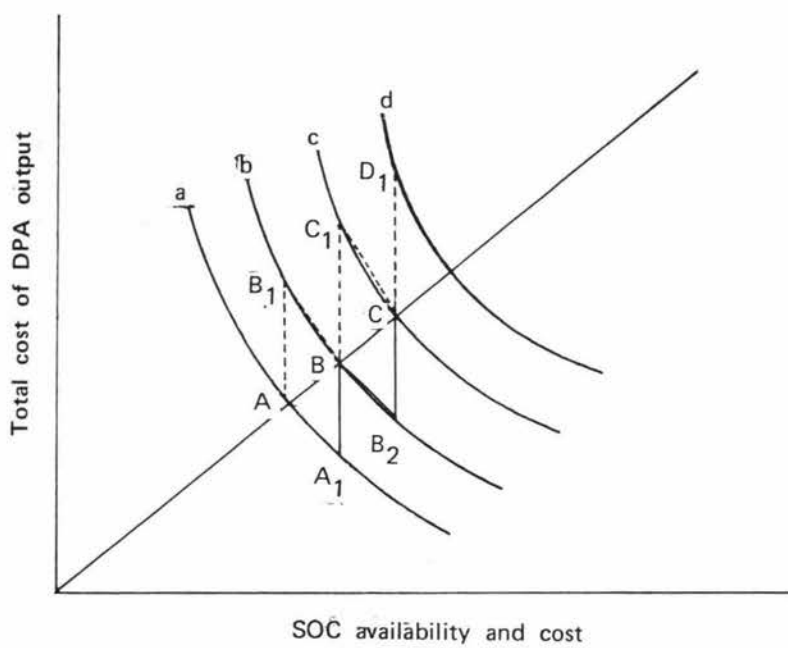
From what has been stated, it could be argued that infrastructure is important as a determinant of growth. It has been seen as a prerequisite to stimulate growth and without it growth would not occur.

INFRASTRUCTURE AS A CONSEQUENCE OF GROWTH.

However there is another side to the infrastructure argument, that is infrastructure is made available as a consequence of growth. Hirschman (1958) is one of the few writers to present an argument for

Figure 1

BALANCED AND UNBALANCED GROWTH OF DPA AND SOC



Source: Hirschman (1958, 87)

infrastructure as a consequence of growth. Hirschman's argument can be illustrated by reference to Figure 1.

Before explaining the meaning of Figure 1, it must be made clear what is meant by the term Directly Productive Activities (DPA). This term refers to private sector activities, that is industry producing products to sell to consumers for profit. Therefore what is being studied is the relationship between the private sector DPA and the indirect productive capital or public sector, which includes both EOC and SOC.

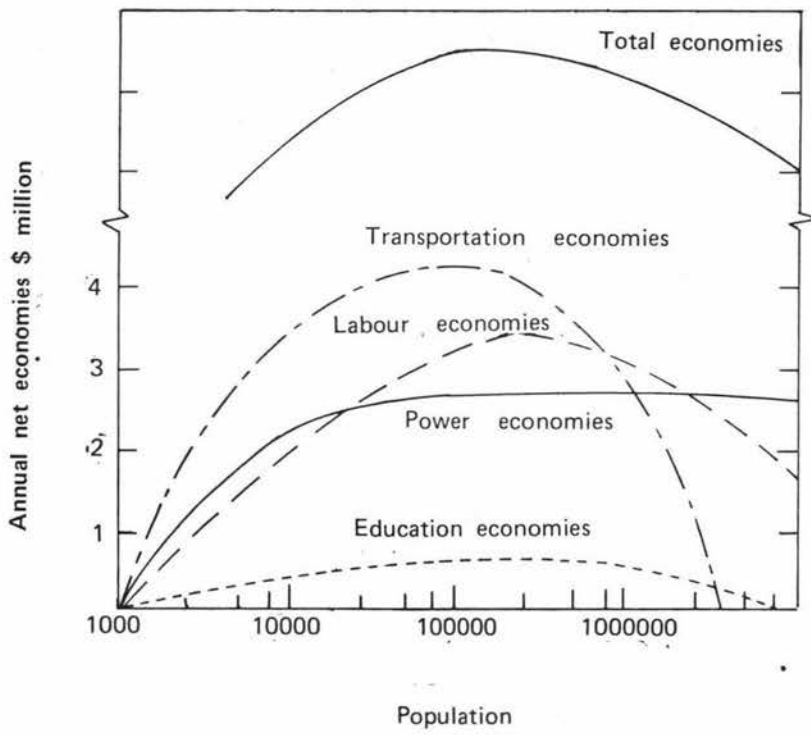
From Figure 1, one can visualise two principal types of sequences. One that starts expansion through increases in the supply of SOC, shown in the figure by the fat line connecting AA_1 BB_2 C and the second sequence where the initial expansionary step is always taken by DPA, indicated in the figure by the dotted lines AB_1 BC_1 C. The first sequence is "development via excess capacity (SOC)" and the second is "development via shortage (SOC)". This is a basic cause or effect argument.

If one starts by expanding SOC, existing DPA production becomes less costly and an increase in DPA investment may start. If expansion of DPA is taken first, DPA production costs are likely to rise substantially and DPA producers will realize the possibility of making considerable economies through installation of larger SOC facilities (Hirschman, 1958, 88).

At this point it is pertinent to explain what is entailed in agglomeration economies and external economies. A city must provide working space, transportation and communication for its industries, and it must also provide living space, recreation areas, public utilities, protection and other services for its people. The concentration of people and economic activities, a characteristic of urban areas, is the direct result of advantages of close contact, this being often referred to as "economies of agglomeration". Such economies are in turn responsible for attracting larger and larger agglomerations of people and economic activity. Agglomeration economies can be described more precisely as external economies of scale to firms in the same or

Figure 2

HYPOTHETICAL ECONOMIES OF SCALE WITH URBAN SIZE



Source: Isard (1956, 187).

different industries. These are downward shifts in the average cost curves of each firm as many industries grow in one place. These have also been called urbanisation economies and include availability of improved transport facilities, such as terminal facilities, a larger and more flexible labour market, commercial and financial services and public services such as police and fire. All these may cause the average costs of a firm to fall for the same rate of production if it locates in a larger rather than a smaller community. Isard (1956) illustrates economies of scale with urban size hypothetically in Figure 2.

Figure 2 shows economies rising with city size to a certain point, beyond which diseconomies of scale begin to operate. There is little empirical support for a specific optimal city size, since as Isard points out, "the situation varies between industries and between individual manufacturers, and we are thrown back on the simple statement that for each firm there are attracting and repelling forces for a location in cities of different sizes (Isard, 1956, 188)".

How would the sequence start at all by expanding DPA, if unaccompanied by a concurrent enlargement of SOC ?

The answer is, even at B_1 , DPA may still be profitable. Moreover we have not debarred ourselves from undertaking public investment in DPA, should we find that the more efficient development sequences is set in motion this way. Thus a new type of infant industry argument is established: in a situation where SOC is not plentiful, it maybe more efficient to protect, subsidise, provide special finance for, or to undertake directly investment in DPA indirectly through investment in SOC. If DPA is allowed or made to run ahead of SOC, strong pressures are set up for the provision of SOC in a subsequent period. Development via shortage is an instance of the "disorderly", "compulsive sequences" (Hirschman, 1958, 88-89).

KEY DIMENSIONS OF INFRASTRUCTURE.

With respect to the levels of infrastructure, there are generally recognised basic services, services which satisfy the needs of a continuing nature. These include housing, water, sewerage, electrical power and other forms of energy, transport and communication facilities. Satisfaction of continuing service needs is a basic condition of

settlement and economic activity in an area. Sparsely populated regions, with many small centres, encounter problems of either concentrating basic services, thus also settlement structure, or, having insufficient service provision.

Personal demand for services in an area is closely connected with the areas general employment situation and income level. Geographical differences in income levels reflect differences in overall productivity between areas and causes significant differences in personal demand for services according to their income elasticity. There will arise a need for services in some areas which will not exist in others. Large towns seem to create health problems which do not exist as highly elsewhere (nervous disorders, coronary, etc.) and a greater demand for general administration, regulation and co-ordination occurs. (Goodall, 1972, 232).

Thus geographical distribution of population, the feature of demand or contact structure and the possible economies of scale in production, are the significant location factors of public goods. The inter-relations between different types of activities plays an important role in the determination of location of public goods and services.

As the urban area grows, the demand for basic services grows proportionately and in addition new requirements occur, such as clean air controls or more efficient and larger traffic controls. The rate of infrastructure change is determined by the above mentioned factors as the urban area undergoes growth.

The compositional change of infrastructure occurs with the size, the geographic nature, the economic situation, and the associated personal demand of the area. As the urban area grows, both economically and in population size, the composition change occurs in both EOC and SOC provision. A small centre may exhibit the basic services, largely EOC, with very few social services such as museums, a hospital

and a large secondary school. The main social services that would be provided would include recreational facilities, such as parks, playgrounds and possibly a small library. As the urban area grows, EOC facilities are extended and modified and new or larger SOC amenities and services are introduced as demanded, or existing amenities are added too.

When supplying a community with certain goods and services, a spillover effect occurs to neighbouring communities. Spillover is defined as 'external benefits or costs to individuals in areas outside the area of political decision making organization' (Nourse, 1968, 231). This is a particular problem in large metropolitan areas throughout the world where fragmented government units exist. In respect to the New Zealand national urban system, the spillover problem is only minor, due to central government allocating most resources and local government merely administering them. However the conceptual points hold even though the empirical problems are not great.

One way of overcoming political fragmentation is to have political consolidation. With political fragmentation too many small political subdivisions exist, being too small to capture many potential internal and external economies of scale. The general case for political consolidation is that there would be more efficient provision of public services, more equitable sharing and financing of these services and more creative and responsive formulation of public policy. However this does not warrant investigation as it is merely a deviation off the main theme of the research and will not bias the final results.

PATTERNS OF INFRASTRUCTURE IN SPACE.

What can be said then, about the patterns of infrastructure in space? As has been stated, EOC amenities are considered basic services for any settlement and are necessary to ensure continued

growth. The level of sophistication may change with the level of development of the urban area. For instance, the water and sewerage systems of small settlements maybe very archaic compared to those of regional centres or metropolitan areas. Some areas may still rely on water tanks for fresh water supply. Electricity is nationwide, but gas supplies are normally only found within the larger centres. Of course a few exceptions do occur to this, and in the case of gas supply it is normally for industrial use and not domestic use. It is also unlikely, to see a small urban area supporting a public transport system, as they would normally rely more on private enterprise to provide bus services to the nearest regional centre, or larger urban area, providing a wider range of services and goods than those present in the smaller urban area.

With respect to SOC amenities, there is a large discrepancy between different sized communities. Thus base hospitals will generally be found in the regional centres with convalescent and smaller hospitals in medium sized urban areas of the region. However due to geographic features and isolation, some smaller areas may host a large hospital to service the surrounding area. An example of such a place is Rawene, in Northland, with a population of 344, where a base hospital is situated to serve a rather isolated area.

Judicial courts will tend to locate in major urban areas, although again geographical features may cause a courthouse to be situated in a small urban area. These types of location patterns continue to arise for most of the specialised social amenities, and it is not until one looks at such services as police and fire, parks and childrens playgrounds, that it is found that most urban areas possess these facilities and services.

It can be seen that there are certain patterns in space for infrastructure which generally hold true for most of the urban communities although there are a few exceptions to this generalisation.

In both SOC and EOC amenities, it is generally population size and density that determines the level of supply of the services. Therefore at the metropolitan level, all basic services would exist plus a wide range of specialist SOC amenities and services, such as research centres and specialised hospitals, as well as specialised EOC amenities and services such as large motorways. As one moves down the urban hierarchy the level of these specialised SOC and EOC amenities declines, until the small centre is reached, where only the basic EOC and SOC amenities and services are found.

GEOGRAPHICAL FRAMES AND HYPOTHESES.

With respect to the study of infrastructure provision within urban settlements of New Zealand a number of geographical frames will be used to help clarify and give a better understanding of the final results. The geographical frames used are as follows:

- a) Inter-regional: this facilitates comparison of regions at different stages of economic development, with possibly different levels of infrastructure development.
- b) Intra-regional frame: Regional centre compared to the smaller centres of the region in regard to required infrastructure and degree found within each urban area.

Characteristics of regional centre would include:

- maintaining largest urban population of region
- transport focus for region
- main export outlet and import receiver of region
- major warehouse and retail area for region
- centre of government institutions of region
- normally growth centre of region
- diverse range of services provided.

Smaller centre characteristics would include:

- small population serving immediate hinterland with necessary everyday services and goods

normally agricultural requirements with one or two small industries located within urban area.

c) Inter-urban: cross sectional comparison of metropolitan areas of various regions, regional centres and smaller towns, to see the different levels of infrastructure for each sized area in space and at which level economies of scale are reached for different components of infrastructure. The difference between this frame and the inter-regional frame is that the cross sectional comparison is undertaking to look at a large number of different sized centres irrespective of their level of economic development, whereas the interregional frame is concerned with regions at different levels of economic development.

d) Inter-island, inter-urban: A study of the comparison between the North Island and South Island urban areas, using a cross sectional analysis of metropolitan areas, regional centres and smaller centres, using a population size scale with an agreed number of urban areas of similar population within each group. This is to be done to see whether there is a marked difference between the levels of infrastructure for different sized urban areas between the North Island urban areas and the South Island urban areas.

From studies conducted overseas, especially by Hansen (1965), the hypotheses below will be tested to see whether the results for New Zealand will be similar to those found in overseas studies. The following hypotheses can be explored for all geographical frames:

1) That overhead capital (OC), especially economic overhead capital (EOC), is directly related to population.

In addition, where population growth has been significant, OC, especially EOC, is directly related to population density.

2) That OC, especially social overhead capital (SOC), is directly related to absolute population size of the community.

3) That OC investment, especially SOC, is directly related to population density.

4) That OC varies with distance away from key metropolitan areas.

5) That OC expenditure decreases with distance away from a regional centre, within a region.

The results of the study should give insights into the provision of services for urban areas within the New Zealand national urban system and help in understanding the importance placed upon EOC and SOC amenities and services for economic growth and prosperity of urban areas. A brief treatment of the history of urban growth in New Zealand in the next chapter serves as a background to the present growth pattern and lays the foundations on which the final results can be presented.

Chapter 2

URBAN GROWTH IN NEW ZEALAND.

By studying the urban history of New Zealand, it is easier to reach an understanding of the forces which have produced the present urban structure. The most critical determinant in the early years of urban growth was that New Zealand was a colony, in which a series of isolated colonisations took place. In these early years each urban area was independent of other urban areas throughout New Zealand, due largely to the isolation of each community. The locations of these urban areas created an uneven distribution, with a concentration on coastal lowlands of both islands.

The economies of the urban areas were initially tied to Britain, and their early functions were to serve as entry points for colonists and outlets for the products of extractive industries, which were sent mainly to Britain.

With successive changes in the importance of different forms of primary production during the early years of development, different regions of the country expanded at different rates. Concomitant to this, there was a tendency for the closest regional centre to the expanding activities, to develop relevant secondary and tertiary functions. This pattern occurred largely because regional economies tended to function in isolation from each other, due to the lack of communication links. This pattern of development continued until the late 1870's, where each region was dominated by one strong regional centre, normally a port centre, with a number of minor towns scattered throughout the region.

Also during this period, the foundations of New Zealand's four major centres were established. The urban centres possessed, or had close by, good natural harbours and early on in their development established other functions associated with "metropolitan" size, such

as large warehouses, universities, national, civil and commercial administration. Due to these urban areas' dispersed locations, and because of poorly developed transport links, they offered little competition to each other during their formative years. Their hinterlands were very large although of unequal development potential which was to prove important for development and growth in latter years, particularly in the case of Auckland.

This was the stage New Zealand's urban system was at by the beginning of the 1880's. Due to technological breakthroughs, the primary industries continued to grow with increasing efficiency, and with the improvements that were made to communications from the 1880's onwards, there was a major stimulus to urban development, at both the regional and metropolitan levels.

The processing industries, such as dairy factories, abattoirs and alike, tended to cluster close to the primary sources or adjacent to regional overseas ports. The higher order tertiary functions, plus what specialised forms of manufacturing that existed at the time, tended to be established at the larger centres. Initially it was the four main centres that shared in the "metropolitan" growth but by the end of the nineteenth century, the balance of primary production and the population, had begun to tilt northwards, so by the early twentieth century the importance of the South Island urban areas had diminished.

Since the end of the nineteenth century there has been two major demographic and economic trends which have had far reaching effects on the urban growth process within New Zealand. Both have lead to an increasing concentration of population, firstly from rural to urban areas, and more specifically from smaller to larger urban areas, until today over eighty per cent of New Zealand's population lives in urban areas (Webb, 1973).

Secondly, the south - north drift has been a gradual, but apparently irresistible, roll forward in which the South Island

dominance of the 1860's - 1870's has given way to the North Island. There were two initial stages in this movement. After the turn of the century, the South Island dominance gave way to that of the lower North Island (East Coast, Taranaki, Wellington). This pre-eminence in turn ceded to the northern half of the North Island (Auckland Province) from the mid 1920's onwards. Today the Auckland area's industrial production is greater than the entire production of the South Island (Webb, 1973).

From the turn of the century rapid growth had been taking place in Auckland, due largely to the momentum gained by rural settlement and the rise in the dairying industry in the Waikato and Hauraki Plains. Auckland was the only major port in the northern part of the North Island and was therefore able to receive full benefits of the intensification of its overseas trade, unlike Wellington, which was forced to share its trade in dairy produce from Taranaki, with the ports of New Plymouth, Patea and Wanganui. The boom in the dairy industry of the Auckland Province thus provided the stimulus to carry the city of Auckland, to the highest urban rank, a position which it has maintained ever since (Figure 3).

The combined effects of both the demographic and economic trends in the past fifty years has been

to concentrate an increasing proportion of the growth in the larger urban areas of the north of the North Island, in the conurbation of Auckland and in its satellite provincial centres, Hamilton, Rotorua, Tauranga and Whangarei (Armstrong, 96).

What has happened in New Zealand's space-economy is a drift of people to a small number of large urban areas, where job opportunities have been much greater compared to the rest of the country. The growth of these centres has taken place, not only at the expense of southern urban areas, but also the smaller urban areas of the northern half of the North Island. Apart from the towns that are based on specific growth industries, such as Tokoroa and Kawerau, many of the smaller boroughs have either stagnated, or in some cases, declined, in

population over recent years.

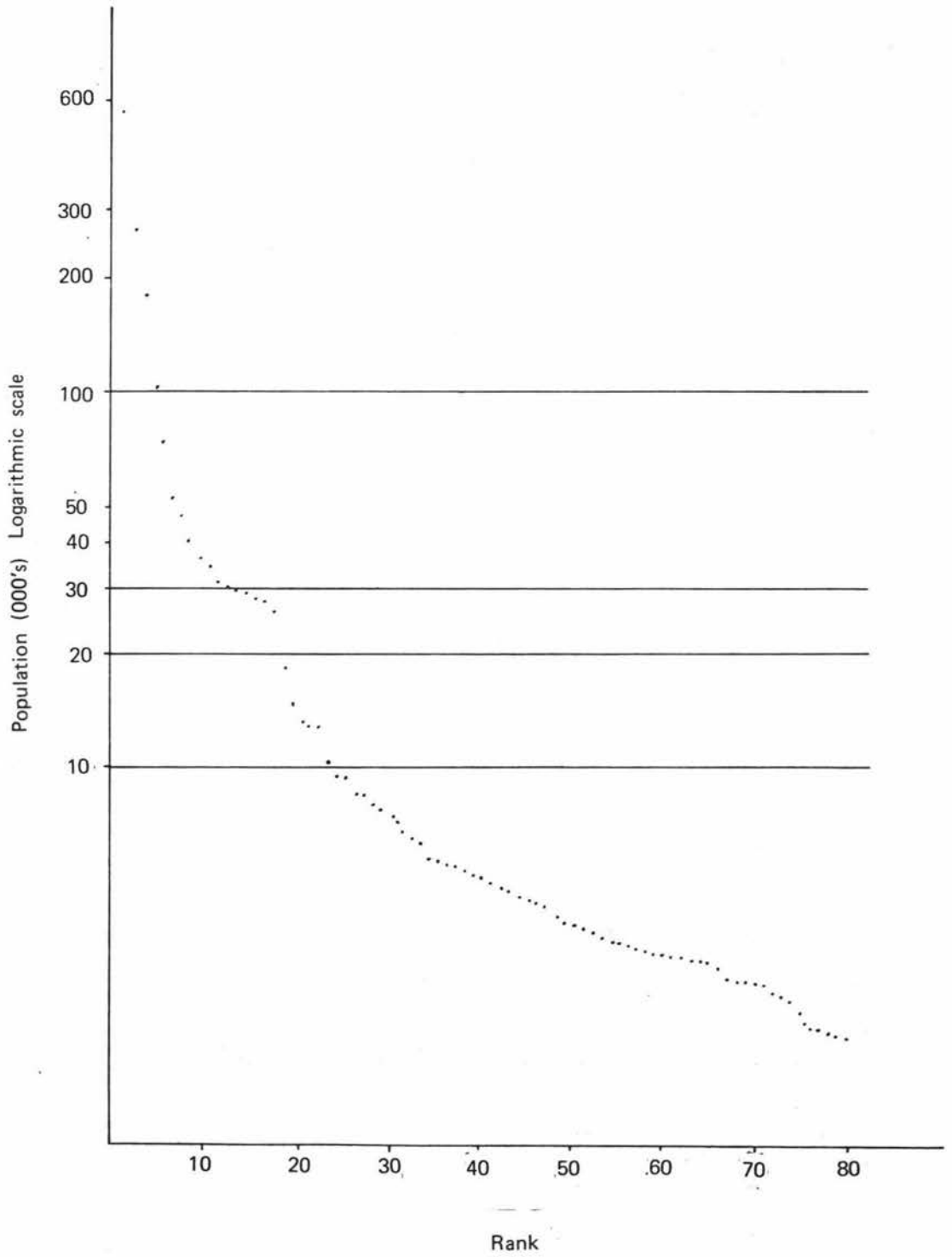
The gap that has occurred between New Zealand's largest urban area and the other main metropolitan areas has been increasing in recent decades, and it seems will continue to widen. The pattern that has emerged in New Zealand is one of a single national centre (Auckland) with strong peripheral sub-centres (regional centres). Most of the urban growth in New Zealand has been in phase with the prosperity of the surrounding countryside, the rise of Auckland to New Zealand's highest ranked city exemplifies this. Urban growth has usually meant continual, if variable, population increase of urban areas, and only some towns, especially those associated with extractive industry, have proved ephemeral.

Figure 3 illustrates the New Zealand urban hierarchy by way of ranking urban areas by population. As has been stated, the four major urban areas are still ranked one to four, although both Auckland and Wellington are the two major urban areas and Dunedin is rapidly being chased by Hamilton for the fourth ranking. An interesting pattern that does emerge is the lack of intermediate sized towns. Between population 10,000 to 26,000, only six towns exist, which helps to illustrate the two tier urban hierarchy that has developed in New Zealand. The top tier consists of the metropolitan centres, dominating large hinterlands which include the provincial "capitals". For example Auckland is eight times larger than Hamilton; Wellington - Hutt is seven times larger than Palmerston North; Timaru is one seventh the size of Christchurch, while Dunedin is over eight times larger than Oamaru.

The provincial "capitals" in turn illustrate "the typical primate urban pattern of New Zealand's functional regions" (Johnston, 190). Therefore the provincial centre has a dominant influence within it's region, just as the metropolitan centres are dominant over a much larger hinterland, which incorporates many of the provincial "capitals", thus displaying the two tier urban hierarchy.

Figure 3

NEW ZEALAND URBAN HIERARCHY BY POPULATION SIZE
FOR TOWNS OF 2000 PLUS IN 1971.



At the national level, no clear primacy exists, although the evidence points to increasing primacy. As New Zealand becomes a more integrated, single space-economy, it is becoming more centralised on Auckland. Projections suggest that, in the absence of any Government intervention, Auckland's economic hold over the country will grow (Hampton 1968, Jensen 1969). It has been suggested that in other countries, increasing primacy is but a growing pain of economic development (Alonso 1968) and with time, centralisation will decline. However whether this will be true of New Zealand is debatable (Johnston, 1971a, 1971b).

Present pattern of growth in New Zealand produces not only regional inequalities in economic terms but also in social and demographic terms, since the three are intertwined in the spatial process of modernisation (Johnston, 1973,84).

This illustrates urban development within New Zealand today and also of the past. It allows interpretation of the inquiry into the five hypotheses put forward as well as indicating the grounds for postulating spatial variation amongst New Zealand urban areas. The extent of this variation has been shown by way of explaining the urban growth pattern over the last century, so that today there is a spatial concentration of urban areas in the northern half of the North Island (Webb, 119). An outcome of this growth has been that larger urban areas grow larger while the smaller urban areas lose population. As a result of this growth, the larger urban areas display greater economic stability, industrial diversification, industrial mix and population heterogeneity, while the smaller urban areas become more and more dependent upon a single industry and in turn experience a certain degree of growth instability (Webb, 1973). As well as this, the study of urban growth allows the identification of urban areas at different levels in the urban hierarchy (Figure 3).

For the moment there seems to be no immediate solution to the urban growth concentration in the northern half of the North Island. The pattern that exists now is likely to consolidate over the next

decade or so, a pattern that has been developing since the turn of the century.

Chapter 3

DATA SOURCES AND DATA ANALYSIS

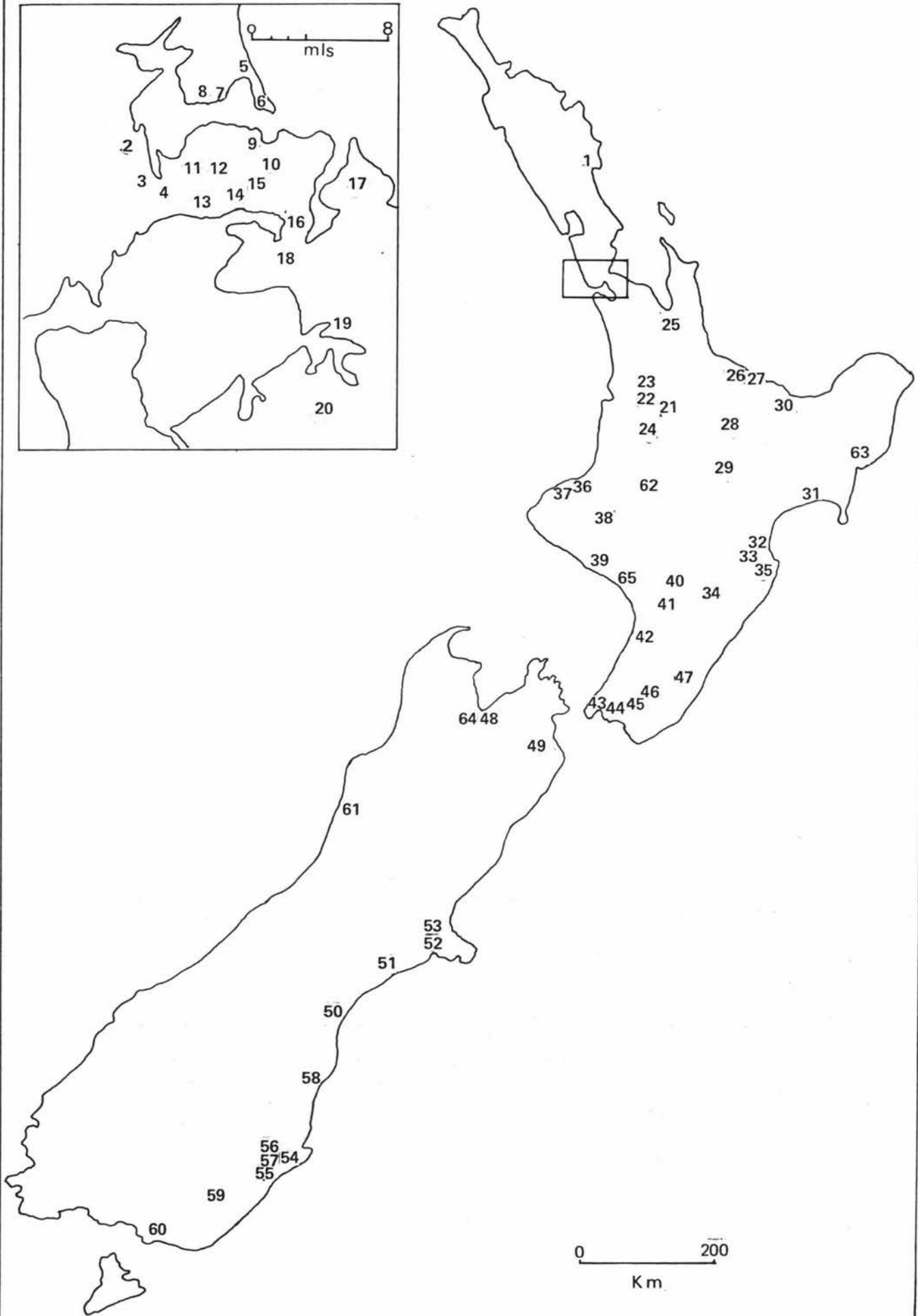
The study of expenditure for the supply of infrastructure needs to cover a reasonable length of time, so as to enable an accurate indication of patterns. To obtain a comprehensive coverage of infrastructure expenditure for New Zealand urban areas, it has meant that the period studied had to be that of the post-war years, from 1946 to 1971; in total a 25 year period. It was hoped that the period could be extended to 1976, but this was not possible due to the unavailability of the more recent, relevant information.

At first, both local and central government expenditure were to be examined separately. However, central government expenditure was either not available, or not in the form desired, so it was decided to confine the study to local authority expenditure on infrastructure. Detailed information, in the form of capital spent by each borough or city, (Figure 4), for a number of components of infrastructure was obtained from the annual series of the Local Authority Handbook. The handbook provides expenditure figures for a number of different components of infrastructure, based on the figures sent in by each local authority, for each financial year.

The years 1946 to 1971 were divided into five periods, each consisting of five years and corresponding with each census period. (e.g. 1946 - 1951). A convention of a statistical year officially starting on the 1 April, and ending on 31 March of the following year was adopted, to coincide with the same format used for each financial year in the local authority expenditure statistics.

To enable the data to be presented in a more workable form, it was decided to take the mean per capita expenditure for a number of urban population size groupings over each of the five time periods. It is important to note here, that the mean per capita expenditure will be slightly higher than what it actually was, due to the fact

LOCATION OF URBAN AREAS OF 5000 PLUS IN NEW ZEALAND IN 1971



NEW ZEALAND URBAN AREAS OF 5000 PLUS 1971

- | | |
|-------------------|-----------------------|
| 1. Whangarei | 33. Hastings City |
| 2. Henderson | 34. Dannevirke |
| 3. Glen Eden | 35. Havelock North |
| 4. New Lynn | 36. Waitara |
| 5. Takapuna | 37. New Plymouth |
| 6. Devonport | 38. Stratford |
| 7. Northcote | 39. Hawera |
| 8. Birkenhead | 40. Feilding |
| 9. Auckland City | 41. Palmerston North |
| 10. Ellerslie | 42. Levin |
| 11. Mt. Albert | 43. Wellington City |
| 12. Mt. Eden | 44. Petone |
| 13. Mt. Roskill | 45. Lower Hutt City |
| 14. Onehunga | 46. Upper Hutt City |
| 15. One Tree Hill | 47. Masterton |
| 16. Otahuhu | 48. Nelson City |
| 17. Howick | 49. Blenheim |
| 18. Papatoetoe | 50. Timaru City |
| 19. Papakura | 51. Ashburton |
| 20. Pukekohe | 52. Riccarton |
| 21. Cambridge | 53. Christchurch City |
| 22. Hamilton | 54. Dunedin City |
| 23. Huntly | 55. Mosgiel |
| 24. Te Awamutu | 56. Green Island |
| 25. Thames | 57. St. Kilda |
| 26. Tauranga | 58. Oamaru |
| 27. Mt. Maunganui | 59. Gore |
| 28. Rotorua | 60. Invergargill City |
| 29. Taupo | 61. Greymouth |
| 30. Whakatane | 62. Taumaranui |
| 32. Wairoa | 63. Gisborne City |
| 32. Napier City | 64. Richmond |
| | 65. Wanganui |

that the average population was not taken over each of the five year time periods, but rather the population at the beginning of each period was taken (e.g. 1961-66, had the population of 1961 taken). However, even though the mean per capita expenditure will be slightly higher than what it actually should be, the patterns that are found will still be the same as those that would have been found, if average population had been used. The general trend that emerges is still the same.

The data is divided into two categories; social overhead capital and economic overhead capital, the two categories of infrastructure. The reasons behind this division of infrastructure into a social category and economic category have already been discussed earlier. It enables a large number of different components to be placed into either one of the two groups and thus give an ordered appearance, which makes for easier analysis. From the data sources used, the components were placed into the above two categories with housing; fire authority; halls, baths, domains, reserves, libraries; plus other recreational facilities, and public transport being placed in the SOC category, while water supply; drainage and sewerage; electrical works; gasworks; roads, streets, bridges and footpaths, were placed in the EOC category. Therefore, when the statistics were required in either SOC or EOC terms the total for each component within the category was added together, and the total gave the SOC or EOC expenditure for a particular urban area, or, a number of urban areas, whichever was required.

DATA ANALYSIS.

Throughout analysis of the data both actual mean per capita expenditure and real mean per capita expenditure were used. The main reason behind the use of both real expenditure and actual expenditure is that actual expenditure displays what is actually spent in dollar terms by each urban area or group of urban areas for a given time, with no account taken of inflation or other forces affecting expenditure over time. Real expenditure is worked out so that inflation is taken

into account, thus giving the real value for the expenditure at a certain time.

Real expenditure was worked out by using the Wholesale Prices Index, produced each year in the Official New Zealand Year Book. Wholesale Price Index numbers have been available in New Zealand since 1920. The index is not a single wholesale prices index, but a series of price index numbers related to broad groupings of the inter-industry transactions distinguished in the government departments input-output tables for the New Zealand economy. Thus each of the index numbers relates to a group of commodity transactions occurring at certain price levels between defined sectors in the economy. Capital goods as well as goods for current consumption or useage are represented in the various commodity flows. The index numbers, while not yet ideal, are a major step towards the calculation of national income, output and expenditure estimates in terms of constant dollars.

For the purpose of this study, the base year was set at 1970-71 and subsequent years back to 1946-47 were calculated by adapting the Wholesale Prices Index in the 1975 and 1966 Official New Zealand Year Books. The mean for each five year period was worked out so that each five year period could be divided by the price deflator, for that particular five year period the deflator was applicable for, and thus provide the real mean expenditure. The Wholesale Prices Index that was computed for the study can be found in Appendix I.

An example of actual expenditure is that urban areas of 50,000+, during 1946-51, had an actual mean per capita expenditure on public transport of \$5-29. Using the same example, the real mean per capita expenditure for public transport during the same time period was \$10-96, using 1970-71 as the base year.

In analysing the data, all geographical frames that were put forward in chapter one, were used so that a wide scope for examining the available data was given. In the inter island - inter urban frame,

towns were placed into different population size groups. To enable a reasonable comparison between the towns of each island, towns of the same or similar population size were grouped, keeping the same number of towns in each population category for both the North and South Islands. By doing this, a more solid comparison was made possible. The infrastructure expenditure was divided into mean per capita SOC and mean per capita EOC and plotted on bar graphs to illustrate the patterns that emerged. The reasons for examining SOC and EOC components separately, was to see if the same patterns emerged as when total overhead capital, that is SOC and EOC combined, was plotted for each population category for both the North and South Islands. This was done for both actual and real expenditure, as is the case for all other frames used.

The analysis used when examining the inter-urban frame, was to take all towns with a population in excess of 5000 at the 1971 census and divide them into population size groups, eight population groupings in all. Taking each of the eight components of infrastructure found in the Local Authority Handbook, each component was plotted separately for the five time periods and for each population size group (Appendix 2).

The intra-regional frame required the examination of a specific region, so that a number of different sized urban areas could be examined with respect to distance away from the major regional centre. The Taranaki region was selected because of the nature of the urban layout of the area. The region provided a good axis on which a number of different sized urban areas were located, further referred to as the New Plymouth - Hawera axis. Both mean real and actual per capita expenditure were plotted for each urban area along the axis, over the twenty five year period, to enable the testing of hypothesis five. The percentage of SOC to OC was also plotted for the six urban areas along the New Plymouth - Hawera axis.

To enable analysis to be conducted under the inter-regional frame, it was necessary to establish a list of regions that were at different stages of economic development. The selection of the regions labelled backward in economic development, were based on the priority regions set down by the Government, priority regions being those that require preferential financial assistance so as to encourage regional development. The two priority regions selected were those of Southland and Taranaki, as they both possessed a reasonable number of urban areas on which information was available, unlike other priority regions such as the West Coast or East Coast - Poverty Bay where the number of centres is quite small. The metropolitan regions of Auckland and Wellington were selected as regions of advanced economic development, while Waikato was selected as a region that had a reasonably wealthy mixed economy, although with a very advanced primary industry, particularly in dairy production.

The selection of these five regions provided five rather large regions within which many urban areas were located and on which information was available. The mean actual and real OC per capita expenditure for each region was plotted, to illustrate the different levels of expenditure on infrastructure provision and to see whether any distinct pattern emerged over the post - war period.

Hypothesis four stated that OC would vary with distance away from key metropolitan areas. Auckland, the highest ranked city with just on 150,000 people, is New Zealand's largest metropolitan centre, and the three other major 'metropolitan' areas of New Zealand, Wellington, Christchurch and Dunedin, are examined with respect to:

- 1) Mean per capita OC outlays for a number of selected regional centres within a 170 mile radius of each metropolitan centre, for each five year period.

- 2) Mean per capita OC outlays in relation to population size groupings, each containing a number of urban areas, for each five year period.

The metropolitan centres incorporated a number of separate boroughs with metropolitan Auckland made up of 21 separate boroughs; metropolitan Wellington 5 separate boroughs; Christchurch 3 and Dunedin 4 (Appendix 3). The Auckland Regional Authority was not included in metropolitan Auckland, as the study only looked at local authority expenditure and the Regional Authority boundary incorporates not only local authorities studied, but also local authorities on which information is not available, as well as local authorities that are not associated with urban areas, such as county councils.

With respect to hypothesis three, SOC as a percentage of OC is related to population density. This was done by taking the population density ratio for each urban area within the study, for the five periods, and then, placing them into a grouping of population per hectare (e.g. 0-4 people per hectare). Once this was done, the mean per capita OC outlay was worked out for each group, as was the mean per capita SOC. The SOC figure was then divided by the OC figure to give the percentage required.

Mean per capita expenditure for each population category was plotted, in both actual and real terms, against time to ascertain whether there was a continual increase in expenditure, whether fluctuations occurred or whether absolute declines occurred for certain population categories.

DISCUSSION OF METHODS

The forms of analysis that have been discussed are those which were found to be the most useful when analysing data of the kind associated with this research. By the use of mean per capita expenditure, it was possible to ensure that any periodic fluctuations or declines in investment for any particular year could be, to a large degree, evened out over a five year period. It was common to find urban areas spending a large amount on a particular infrastructure component over two or three years, and then spending very little,

except for maintenance, for the next three to five years. By using mean per capita figures it spread the expenditure over the five years, and thus gives a more accurate picture of the expenditure by each urban area.

Per capita expenditure is valuable, as it acts as an evening out device for expenditure. For example, some regions, such as Auckland, have large populations and consequently will have high expenditure to maintain adequate infrastructure services, while a less densely populated area, Southland for instance, would be expected to have lower expenditure. If only total OC was taken, this would be higher for the densely populated regions than those regions less densely populated. By working out expenditure on a per capita basis, expenditure maybe very similar, or even higher for the less densely populated region. Examples of this will be shown when discussing the findings of the research.

The use of five year periods was necessary, due to the large number of figures that were accumulated, remembering that figures for each year and each borough in New Zealand were collected over a period of twenty five years. Thus by using five year periods, corresponding with census periods, and mean per capita expenditure, it enabled the breaking down of the vast mass of statistics accumulated into a more compact, workable form.

The importance of using real expenditure as well as actual expenditure has already been noted. If only actual expenditure had been used, then it would be fair to suggest that there would occur a continual increase in general expenditure from 1946 to 1971, due to increased costs over the twenty five year period, plus the fact that many of the urban areas were growing and requiring additional infrastructure provision.

The introduction of real expenditure provides a comparison when looking at actual expenditure. By plotting both actual and real

expenditure on separate graphs, it is possible to see whether the increase in actual expenditure over time is merely keeping up with inflation, or whether in fact there is an actual increase in expenditure above the inflationary rate. By using the Wholesale Prices Index, expenditure is made to equal 1970-71 values, as this was the base year chosen. Thus real expenditure provides a comparison with actual expenditure and helps to explain the reasons for the patterns that emerge. It adds more meaning to the final analysis of the data.

The geographical frames used were selected to provide a large number of different avenues, from which urban areas infrastructure expenditure could be analysed. They gave ways of studying all the urban areas of New Zealand, a comparison of North Island and South Island urban areas, down to studying individual regional urban hierarchies. By the use of the geographical frames put forward, the study of infrastructure provision in New Zealand urban areas, was made more comprehensive and meaningful.

Depending upon what approach was being used, different population groupings were formed. When all New Zealand urban areas were being studied, the population groups were established so that within each category, a similar number of towns, for each time period, would be grouped. As would be expected, it was almost impossible to reach this aim everytime, but the final categories decided upon were the closest to the desired result. Naturally, some groups obtained more towns over time, while other groups actually disappeared. The disappearance of the 0-2500 population group from 1961 onwards, and the 2501-4000 population group from 1966 onwards can be explained by the fact that towns of 5000 plus from the 1971 census were used in the study. As a result of this, as these towns grew in population size over the 25 year period those that were placed in the smaller population groupings moved out of these and into larger population groupings; thus explaining why the 6001-12000 group continued to rise from 12 towns in 1946-51 to 22 towns in 1966-71, while the 0-2500 group and 2501-4000 group

became nonentities after 1961 and 1966 respectively. However, the groupings remained the same to ensure uniformity of results over the 25 year period.

When the North Island - South Island comparison groupings were established, it was necessary to change the population categories so that it was possible to have urban areas of similar size from each island for analysis. Therefore the groupings were somewhat different than those used in the analysis of urban areas for all of New Zealand (Appendix 4).

When forming population per hectare groupings, the same reasoning was applied as that used for the formation of population groupings when studying the New Zealand urban areas. The groups were devised to have as even a distribution of towns in each group as possible, for the whole post war period. As was the case before, some groupings disappeared overtime while others increased, particularly the 15.1-40.0 people per hectare group (Appendix 5).

Finally, with the analysis of the data completed, it was then necessary to present the results in a simple and clear manner, so that they could easily be understood. It was decided that the best way of achieving this was by the combined use of simple graphs and charts. These, then, represent a summary of the reasons behind the methods of analysis adopted for this thesis investigation.

PATTERNS OF INFRASTRUCTURE EXPENDITURE
FOR NEW ZEALAND URBAN AREAS.

Expenditure by Local Authorities on the various components of infrastructure, is one way of being able to gauge how areas are provided for by their local governments. As each urban area grows, so the required infrastructure to support the growth might increase. It would therefore be thought that urban areas experiencing rapid growth would also be experiencing high expenditure with respect to infrastructure outlay, and that the older, more established settlements would have a lower expenditure outlay.

The following analysis is based on a total of 65 New Zealand urban areas. The analysis of the data is presented in eight sections dealing with:

- 1) Mean real and actual per capita expenditure in relation to the eight infrastructure components for urban areas of New Zealand.
- 2) A comparison of selected North Island and South Island urban areas for actual and real mean per capita overhead capital expenditure.
- 3) A North Island - South Island comparison for both actual and real mean per capita expenditure for SOC and EOC categories.
- 4) Actual and real mean per capita expenditure for a regions urban areas, with a proposal that an urban hierarchy of expenditure exists within a region's boundaries.
- 5) A comparison of selected regional centres away from the four main metropolitan areas (actual and real mean per capita expenditure). Also, the metropolitan areas are compared with urban areas in different population groupings, irrespective of distance away from the metropolitan areas.
- 6) An examination of actual and real mean per capita expenditure for five regions at different stages of economic development.
- 7) Variation in actual and real mean per capita expenditure

over time for each of the population groups.

8) A study of SOC as a percentage of OC, in relation to the population density groupings.

MEAN EXPENDITURE ON DIFFERENT COMPONENTS OF INFRASTRUCTURE.

With the 65 towns covered in the research, each town was placed within a population grouping. In the first section, each population grouping was examined with respect to the eight infrastructure components that have already been stated earlier. Looking at the SOC components, housing and fire authority expenditure are the lowest two components, with respect to expenditure on a per capita basis, for all population groupings. In fact, fire expenditure disappears from towns of 20,000 onwards, while housing expenditure tends to rise from the towns of 20,000 plus in population. Even though this does occur, expenditure for housing never rises higher than \$4-00 per head, in real terms, this expenditure being found in urban areas of 50,000 plus in population. Fire expenditure reaches it's highest level in the 2501-4000 urban grouping, of \$1-90 per head of population.

Public transport expenditure is absent from the smaller urban areas, although an exception does occur in the 4001-6000 group, but the expenditure never rises above 30 cents per head of population. The first major expenditure for transport occurs in urban areas of 12,001-20,000, but after the initial five year period of 1946-51, expenditure drops to be no higher than 10 cents per head from 1951 onwards. With respect to towns of 20,000 plus in population public transport expenditure tends to fluctuate, but at the same time display a tendency to either decline or even out to a static expenditure over the post war period.

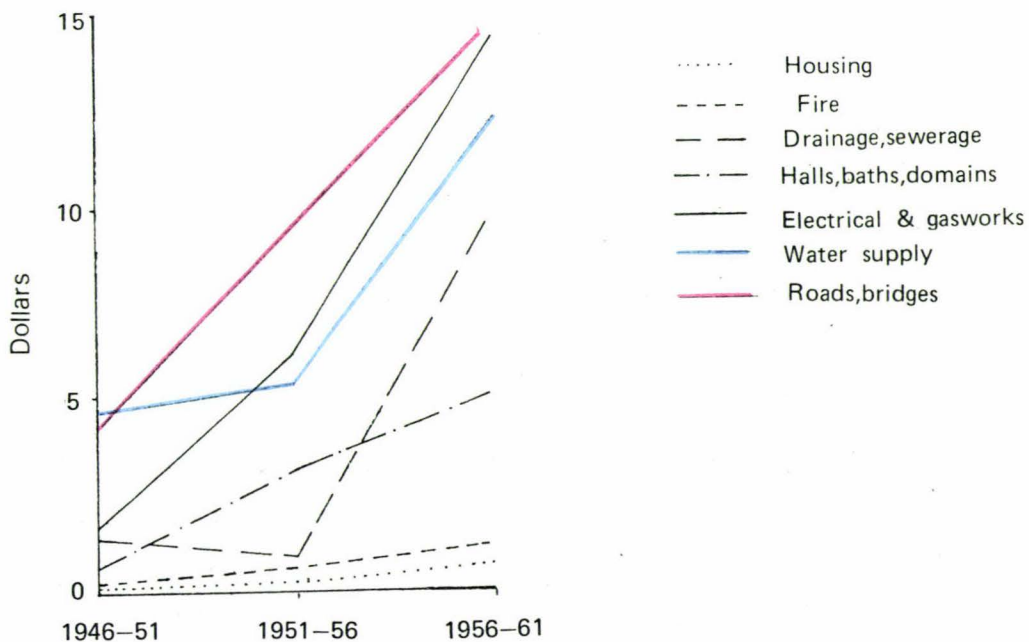
The most important group of components found within the SOC category, appears to be halls, baths, domains, libraries and other recreational facilities. This group displayed the highest expenditure of all groups within SOC and continued to increase, on a per capita

basis, for most of the population groups over the whole 25 year period (Table 2). In the lower populated areas, the EOC components tend to have higher expenditure than SOC components, but from towns of 6000 plus, expenditure on the recreational group, generally exceeds the two EOC components of water supply and drainage and sewerage. Over the eight population groups, expenditure on the recreational group doubles from \$5-00 per head for the 0-2500 group to \$10 per head for the 50,001 plus group. However in real terms, the increase over the eight groups is only just over 50 per cent, from \$7-30 to \$11-20 respectively.

From these findings, it appears that in the smaller urban areas, SOC expenditure is played down while EOC expenditure is more important, due largely to the fact that the urban areas require basic services to facilitate growth before they require the social services, which add to the quality of life of the urban area (Figure 5).

Figure 5

MEAN PER CAPITA INVESTMENT URBAN AREAS SIZED 0-2500



Source: Adapted from Local Authority Handbook

TABLE 2
REAL EXPENDITURE FOR RECREATIONAL
GROUP OF SOC CATEGORY

Population	1946-51	1951-56	1956-61	1961-66	1966-71
0 - 2500	1.55	4.92	7.37	-	-
2501 - 4000	2.46	2.95	7.50	5.49	-
4001 - 6000	2.98	4.93	10.25	6.60	6.28
6001 - 12,000	2.69	4.24	6.31	6.08	7.77
12,001 - 20,000	4.31	3.40	5.31	8.05	7.88
20,001 - 30,000	3.62	4.36	7.47	7.79	7.56
30,001 - 50,000	5.14	9.87	10.25	10.47	10.10
50,001 - +	5.43	7.25	8.41	9.62	11.28

Source: Compiled from Local Authority Handbook

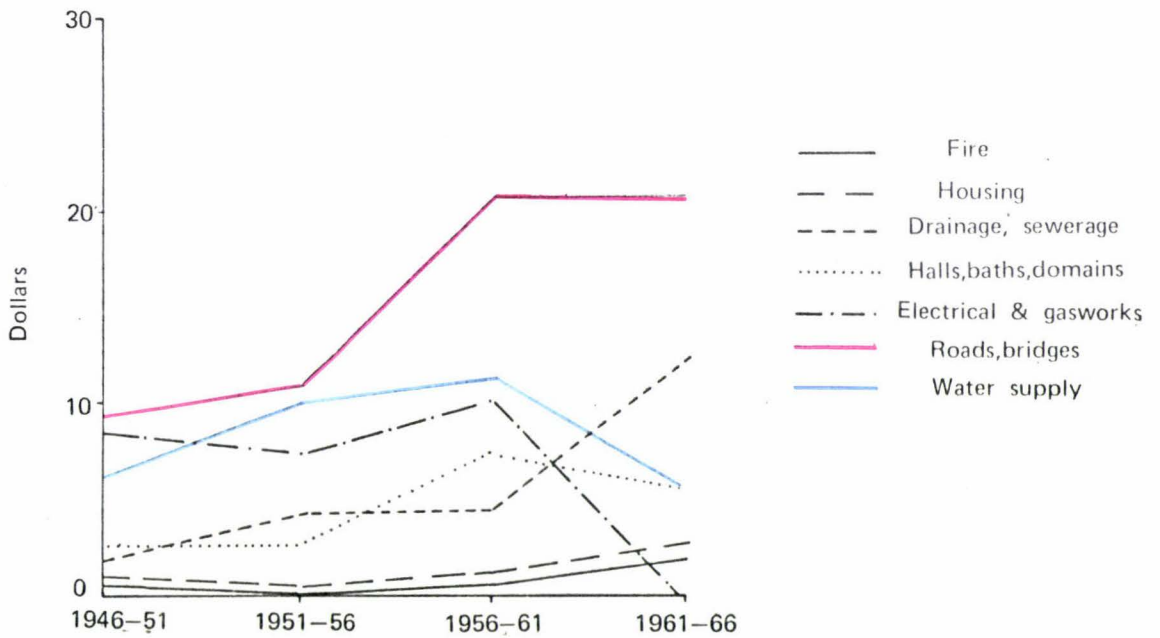
EOC components tend to display the highest expenditure on a per capita basis, particularly in the smaller urban areas. Roads, bridges and footpaths is the highest expenditure component for settlements up to 20,000, and for certain population groupings, is on an average \$5-00 per head more than any other component, either in the EOC or SOC categories. However this dominance in expenditure is superceded in urban areas 20,000 plus, by electrical and gasworks expenditure. On average, the difference between this expenditure and the next highest component is around \$20 per head (Figure 7). Although this displays the two highest expenditure components within EOC, the most interesting pattern arises out of water supply and drainage and sewerage expenditure.

Generally, the expenditure on drainage and sewerage is lower than that of water supply, but throughout the 25 year period, fluctuations in both components expenditure occurs. For most occasions, when water supply expenditure shows a decline, expenditure on drainage and sewerage increases. This pattern is particularly evident in urban areas with lower populations (Figure 6). It could be suggested from this, that the first priority of local authorities has been to establish a water supply system, and once this has been completed, that a sewerage and drainage programme is initiated. The pattern of the 2501-4000 population group displays this factor, when water supply expenditure drops from \$11 per head in 1961-66 to \$5-50 per head in 1966-71, while drainage and sewerage increases from \$4-50 per head to \$12-50 per head over the same time period. Expenditure on these two components in the larger populated areas tends to be very similar in dollar terms, possibly due to the fact that many of the larger urban areas possess complex systems and only expenditure on maintenance and the occasional new addition to the existing system for new suburban areas, occurs.

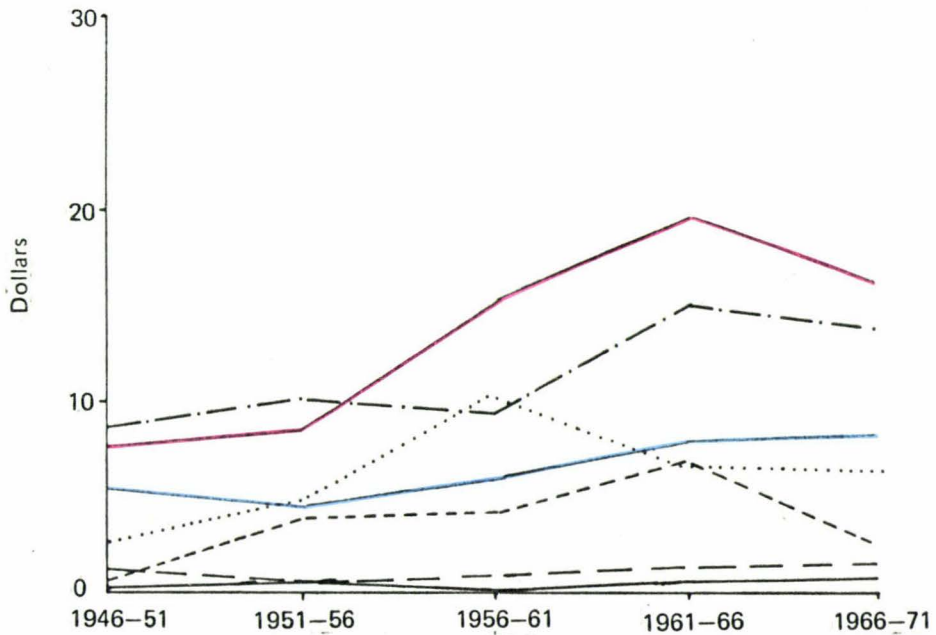
The only significant aspect to emerge when comparing actual and real mean per capita expenditure, is that for the population group 12,001-20,000, every component of EOC and SOC displays a decline in expenditure (Figure 8). This is the only population group in which

Figure 6

MEAN REAL PER CAPITA EXPENDITURE URBAN AREAS SIZED 2501-4000



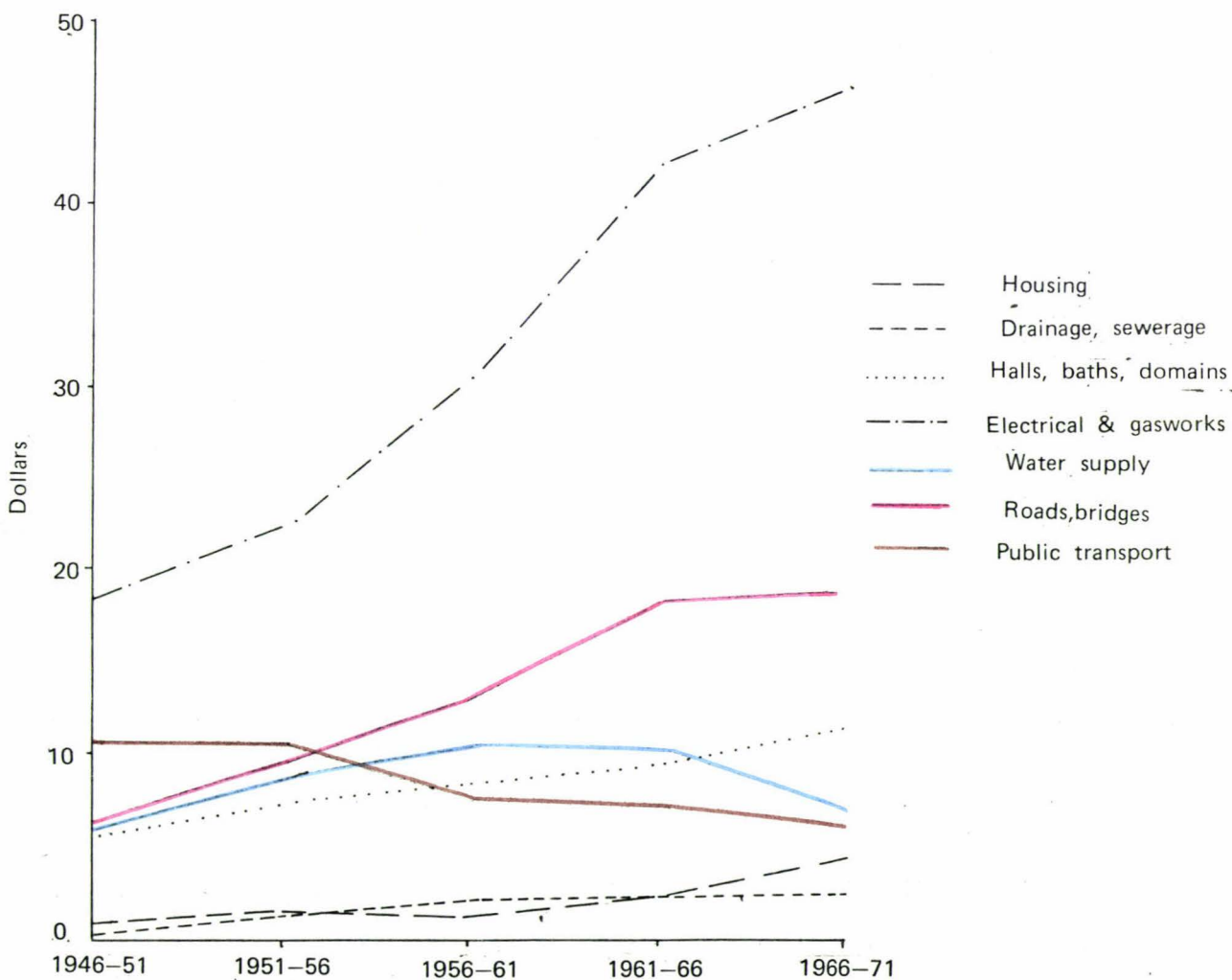
MEAN REAL PER CAPITA EXPENDITURE URBAN AREAS SIZED 4001-6000



Source: Adapted from Local Authority Handbook

Figure 7

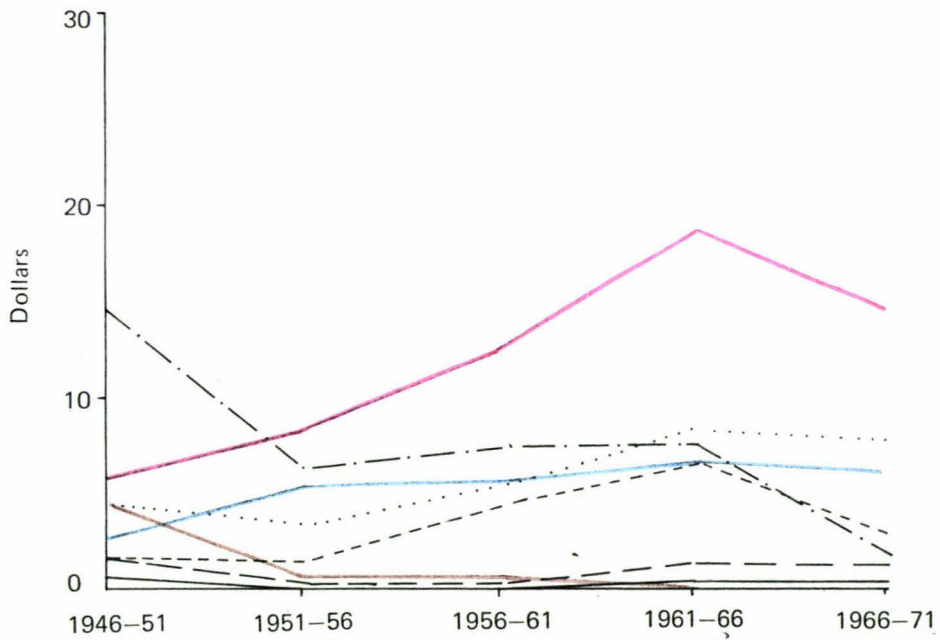
'MEAN REAL PER CAPITA EXPENDITURE URBAN AREAS SIZED 50001 PLUS



Source: Adapted from Local Authority Handbook

Figure 8

MEAN REAL PER CAPITA EXPENDITURE URBAN AREAS SIZED 12001-20000



Source: Adapted from Local Authority Handbook

- Fire
- Housing
- - - Drainage, sewerage
- Halls, baths, domains
- · - · Electrical & gasworks
- Roads, bridges
- Water supply
- Public transport

this occurs, others display declines in particular components, but not the eight categories at once. It is hard to establish a reason for this, but it is a pattern that occurs throughout the study. It is true that these centres are few in number when taking all urban areas in New Zealand into account, and that they represent a transitional period in the two - tier urban hierarchy, suggested by Figure 3.

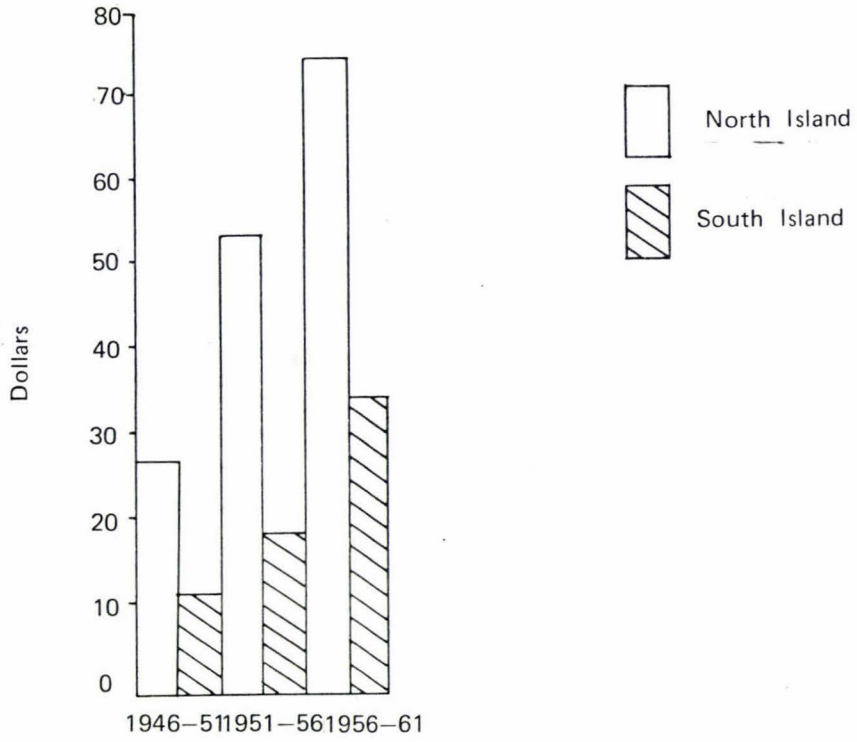
From this it could be suggested that these urban areas have reached a point where they are experiencing only a very slow growth rate or are actually declining in population, and thus increased expenditure on new infrastructure is not required, as the infrastructure already provided is adequate to serve these urban areas.

NORTH ISLAND - SOUTH ISLAND URBAN COMPARISON.

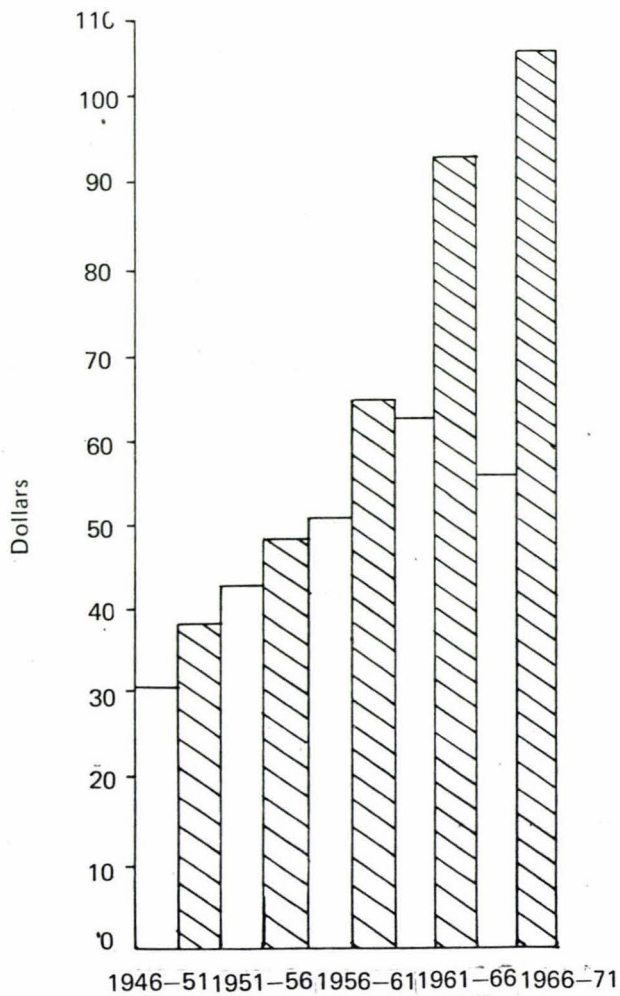
The second section examines a comparison of a number of North Island and South Island urban areas mean OC expenditure, on a per capita basis. Again, population groupings were used, with OC expenditure, that is both EOC and SOC expenditure combined, being examined for each grouping. Following this in section three, a separate examination of SOC and EOC expenditure for the same North Island and South Island urban areas is conducted.

Urban areas up to 8000 in population size, were found to have a higher expenditure in the North Island, particularly the 0-2500 group, where North Island expenditure was over 100 per cent more than South Island, even though South Island expenditure continued to rise (Figure 9). As before, the 8001-20,000 group experienced a decline for both islands in the final five year period, and before this there was little difference in expenditure between the urban areas of both islands. Urban areas possessing more than 20,000 in population in the South Island, completely dominated expenditure when compared with the North Island urban areas of the same size. Throughout the whole post-war period, South Island areas were higher, from \$6 to \$15 per head between 1946-61 and \$25 to \$50 per head 1961-71 (Figure 9). When taking actual

Figure 9
 MEAN REAL PER CAPITA EXPENDITURE URBAN AREAS SIZED 0-2000:
 NORTH ISLAND - SOUTH ISLAND COMPARISON.



MEAN REAL PER CAPITA EXPENDITURE FOR URBAN AREAS SIZED 3001 PLUS:
 NORTH ISLAND - SOUTH ISLAND COMPARISON.



expenditure, the pattern for both islands is one of increasing expenditure for each five year period, but when compared with real expenditure, the North Island areas display a decline in expenditure, during the last five to ten years (Figure 9).

Two distinct groups arise from the study of total OC expenditure. The first group is that of towns of up to 8000 in population, where North Island urban areas were on an average, higher in mean per capita expenditure. The second group begins at urban areas of 20,000, in which the South Island was completely dominant in expenditure, over the North Island. The transitional group of 8001-20,000, again showed a tendency to decline in expenditure during 1966-71, with the North Island being slightly higher in expenditure over the latter ten years.

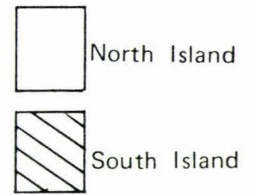
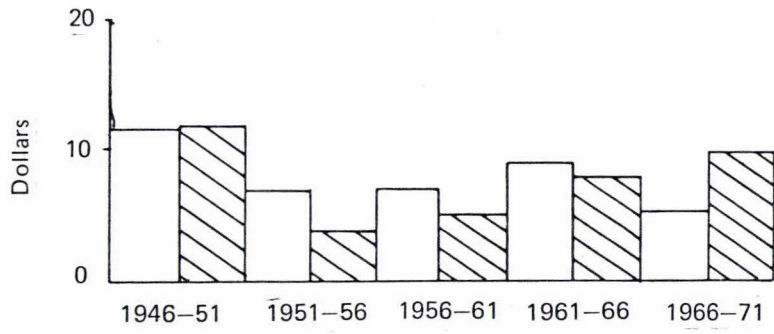
SOC AND EOC COMPARISON OF NORTH ISLAND AND SOUTH ISLAND URBAN AREAS.

The purpose behind the third section is to see if the SOC and EOC expenditure displayed the same pattern as OC expenditure, or whether variations arose. In taking SOC expenditure it was found that the North Island urban areas were generally displaying a higher expenditure in the SOC category, for all the population groupings, with only the occasional five year period where the South Island expenditure was higher. The 20,001-30,000 population group illustrates this pattern, where only slight differences occur for each time period (Figure 10).

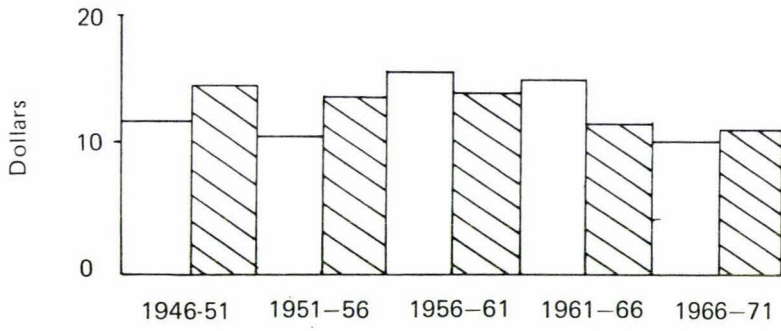
When taking mean real expenditure for SOC, the pattern remains basically the same as actual expenditure, although the 8001-20,000 group shows an interesting aspect. Normally a decline has occurred in all expenditure, but this time the South Island urban areas show an increase in SOC expenditure. The increase from 1961-66 to 1966-71 is 10 per cent for SOC expenditure, while EOC expenditure decrease by 10 per cent, to account for 72 per cent of all expenditure for 1966-71 (Figure 10).

Looking at actual EOC expenditure, the North Island urban areas

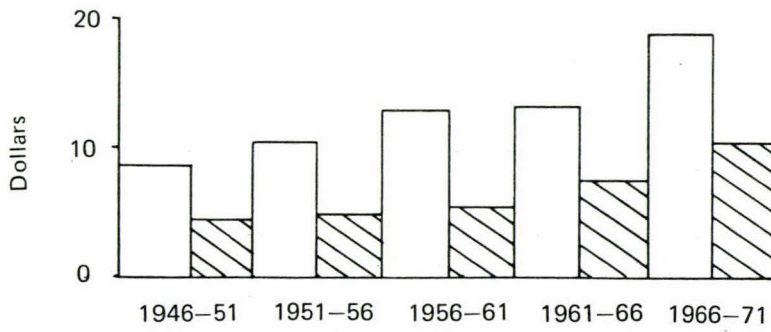
MEAN REAL PER CAPITA SOC EXPENDITURE FOR URBAN AREAS SIZED 8001-20000:
NORTH ISLAND - SOUTH ISLAND COMPARISON.



MEAN REAL PER CAPITA SOC EXPENDITURE FOR URBAN AREAS SIZED 20001-30000:
NORTH ISLAND - SOUTH ISLAND COMPARISON.



MEAN REAL PER CAPITA SOC EXPENDITURE FOR URBAN AREAS SIZED 30001 PLUS:
NORTH ISLAND - SOUTH ISLAND COMPARISON.



continue to show higher expenditure for urban areas up to 8000 in population size (Figure 11). The 8001-20,000 population group displays higher expenditure for the South Island until 1961, and then a decline occurs to allow North Island areas to become higher in per capita expenditure between 1961-71. However, for urban areas of 20,000 plus, the same pattern as that in OC expenditure occurs, with the South Island urban areas showing a continual increase in expenditure, far above that of the North Island urban areas. In comparing real and actual expenditure, very few changes appear in the overall per capita expenditure pattern.

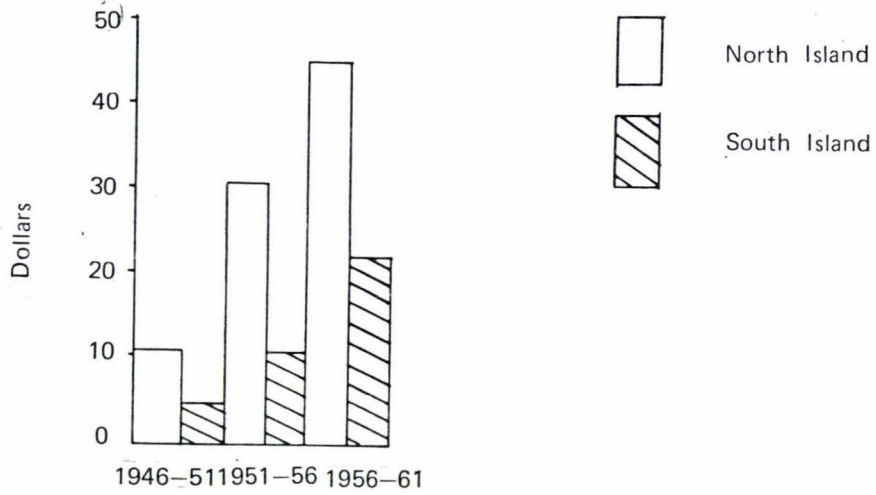
Higher North Island urban area expenditures in SOC is possibly associated with New Zealand's urban growth overtime, especially the growth that has taken place during the twentieth century. With increasing concentration of New Zealand's population in the North Island, the urban areas have had to establish their basic services, that is EOC infrastructure, much earlier on in their development, and that since the post-war period the larger centres particularly have been able to concentrate more of their expenditure on SOC components of infrastructure. For example, the difference between the 30,001 plus urban areas of the North Island and South Island is that in 1966-71, 34 per cent of total expenditure for North Island urban areas was spent on SOC category while only 9 per cent was spent on the same category for the South Island.

In addition to this, North Island areas experienced higher expenditure in EOC in the smaller urban areas. This could be explained by the fact that many of these settlements are growing at a faster rate than South Island settlements of similar size, due to the movement of population to the north. Thus to accomodate growth, higher expenditure is required.

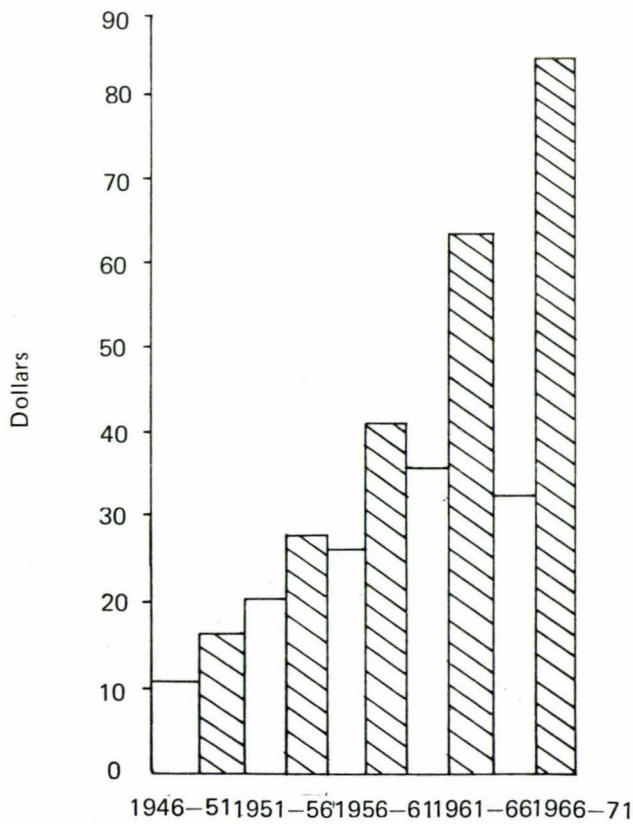
The higher expenditure in EOC for the South Island urban areas of 20,000 plus can be explained by the fact that large amounts of capital per head of population have been invested in electrical and gasworks.

Figure 11

MEAN REAL PER CAPITAL EOC EXPENDITURE FOR URBAN AREAS SIZED 0-2000:
NORTH ISLAND - SOUTH ISLAND COMPARISON:



MEAN REAL PER CAPITA EOC EXPENDITURE FOR URBAN AREAS SIZED 3001 PLUS:
NORTH ISLAND - SOUTH ISLAND COMPARISON.



If it were not for this factor, expenditure would be lower than North Island urban areas, as expenditure on the other components of EOC are higher on a per capita basis for North Island urban areas.

REGIONAL URBAN HIERARCHY.

The New Plymouth - Hawera axis contains six towns, all with different sized populations and varying from around seven miles to 46 miles away from New Plymouth (Figure 12). The intention is to establish whether there exists some form of hierarchy in expenditure. The scrutiny of actual mean per capita OC expenditures, produced a pattern which suggested that the further an urban area was located away from New Plymouth then the less it spent on total OC. Therefore New Plymouth had the highest expenditure of any of the towns over the period studied, and showed a rapid increase in expenditure for the 1966-71 period. Inglewood was the second highest town for per capita expenditure, and it too displayed a rapid increase in the period 1966-71 while Stratford displayed a continual increase throughout the period, although considerably lower than New Plymouth and Inglewood.

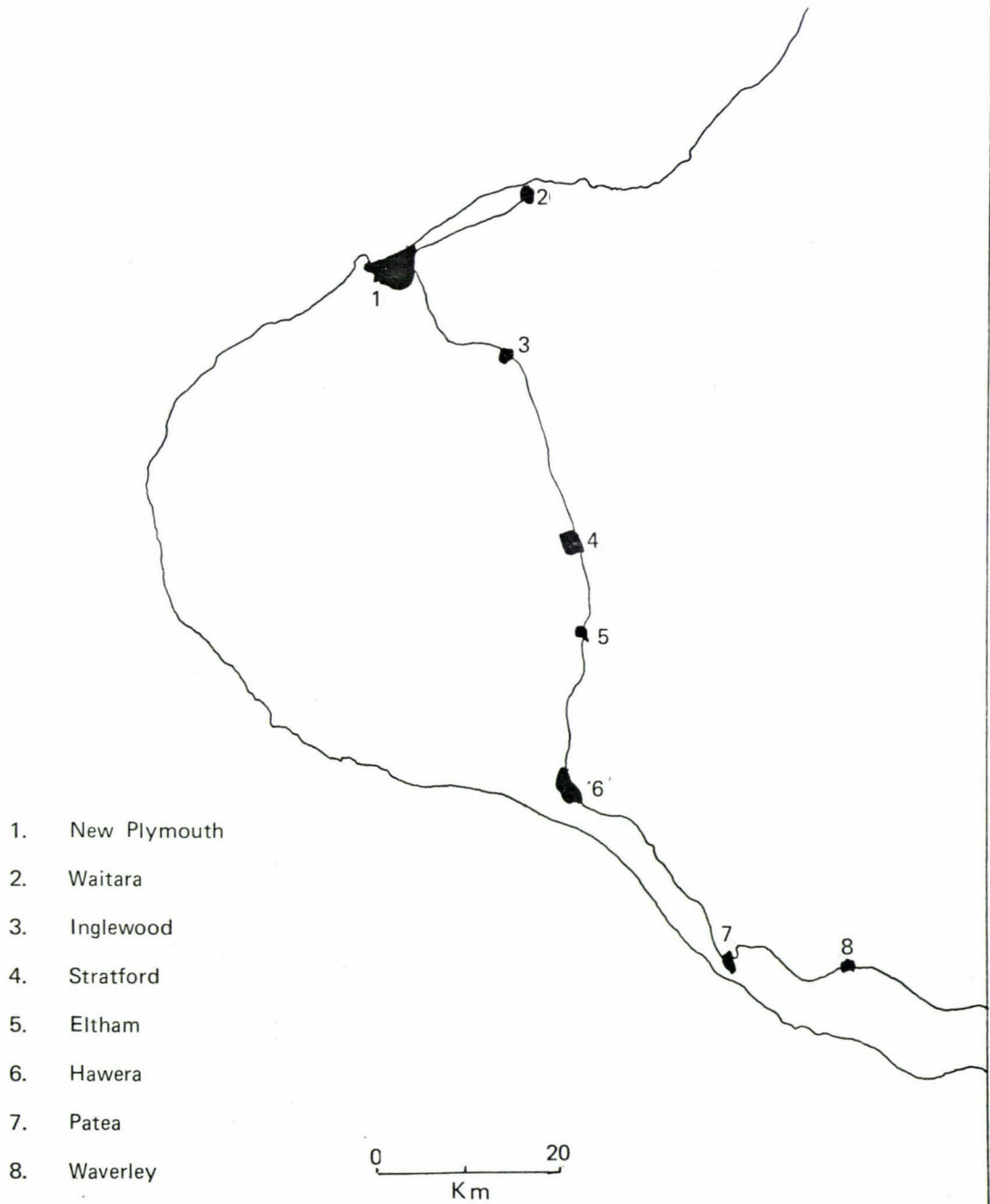
Eltham and Hawera were very low in expenditure compared to the other towns mentioned and a reasonable gap appeared between the expenditure of these two towns and the expenditure of Stratford. Hawera's expenditure did suggest that it played a role as a centre for the smaller towns south of Taranaki, such as Patea and Waverley and to a certain degree Eltham, as Hawera's expenditure did surpass Eltham's over the last decade.

Waitara's pattern is one of fluctuation, but tending to decline overtime. This could possibly be accounted for by the fact that Waitara is an old, established settlement, and that most of the towns basic services were provided for long before the post-war years.

The findings from this study supported those put forward by Simmons in his study of local authority expenditure and population growth in Taranaki (Simmons, 1975). He found that New Plymouth exerted

Figure 12

NEW PLYMOUTH – HAWERA GROWTH AXIS



dominance over the whole axis and that total expenditure tended to closely follow the population trends except for Hawera, which had low expenditure, and Inglewood, which had high expenditure.

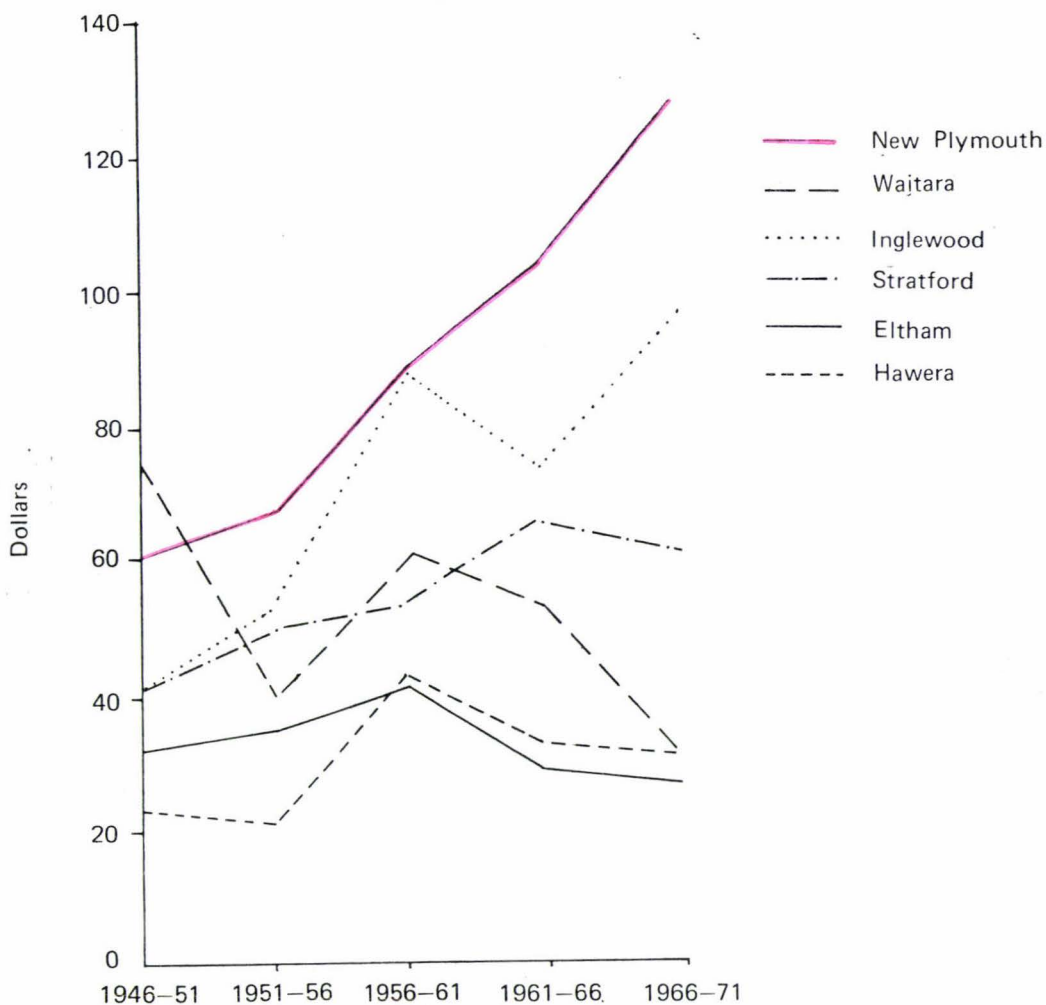
Figure 13 illustrates the pattern of real mean per capita expenditure for the New Plymouth - Hawera axis. The most interesting aspect of this graph is that in the period 1966-71 all but two towns showed a decline in expenditure. New Plymouth and Inglewood continue to show an increase, although New Plymouth is the only settlement to show a continual increase throughout the post-war period. New Plymouth's expenditure increase suggests that it is the only centre experiencing continual growth in population, thus supporting the idea that New Plymouth is the dominant urban centre of the region.

Inglewood's expenditure was largely found to be in the EOC category, particularly in water supply (1956-61) and drainage and sewerage (1966-71) as well as high expenditure on electrical and gas-works throughout the period. This pattern of expenditure suggests that Inglewood has been experiencing an increase in population and thus a requirement to establish new systems in the form of basic services such as water supply and the like. It could also suggest that New Plymouth's growth is overspilling into its surrounding urban areas, and that Inglewood is developing into a dormitory settlement for New Plymouth. The decline experienced by the other centres suggests either that very little population growth is occurring in these areas or that the rate of inflation has surpassed the rate of increase in the amount of money being invested by the local authorities.

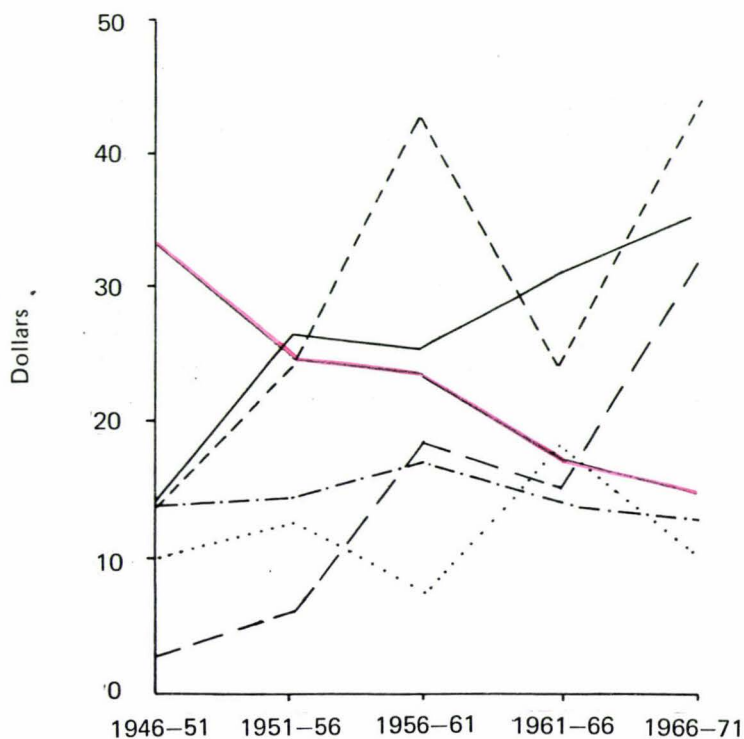
When SOC is examined as a percentage of OC, a different pattern emerges, in fact it is almost a reversal of mean per capita expenditure (Figure 13). Hawera and Eltham become the highest SOC expenditure areas, although fluctuations do occur, and Waitara displays an almost continual increase, which helps justify the reason put forward on Waitara's low per capita OC expenditure. At the same time, New Plymouth

Figure 13

MEAN REAL PER CAPITA EXPENDITURE FOR NEW PLYMOUTH – HAWERA AXIS



PERCENTAGE OF OC ACCOUNTED FOR BY SOC FOR NEW PLYMOUTH – HAWERA AXIS

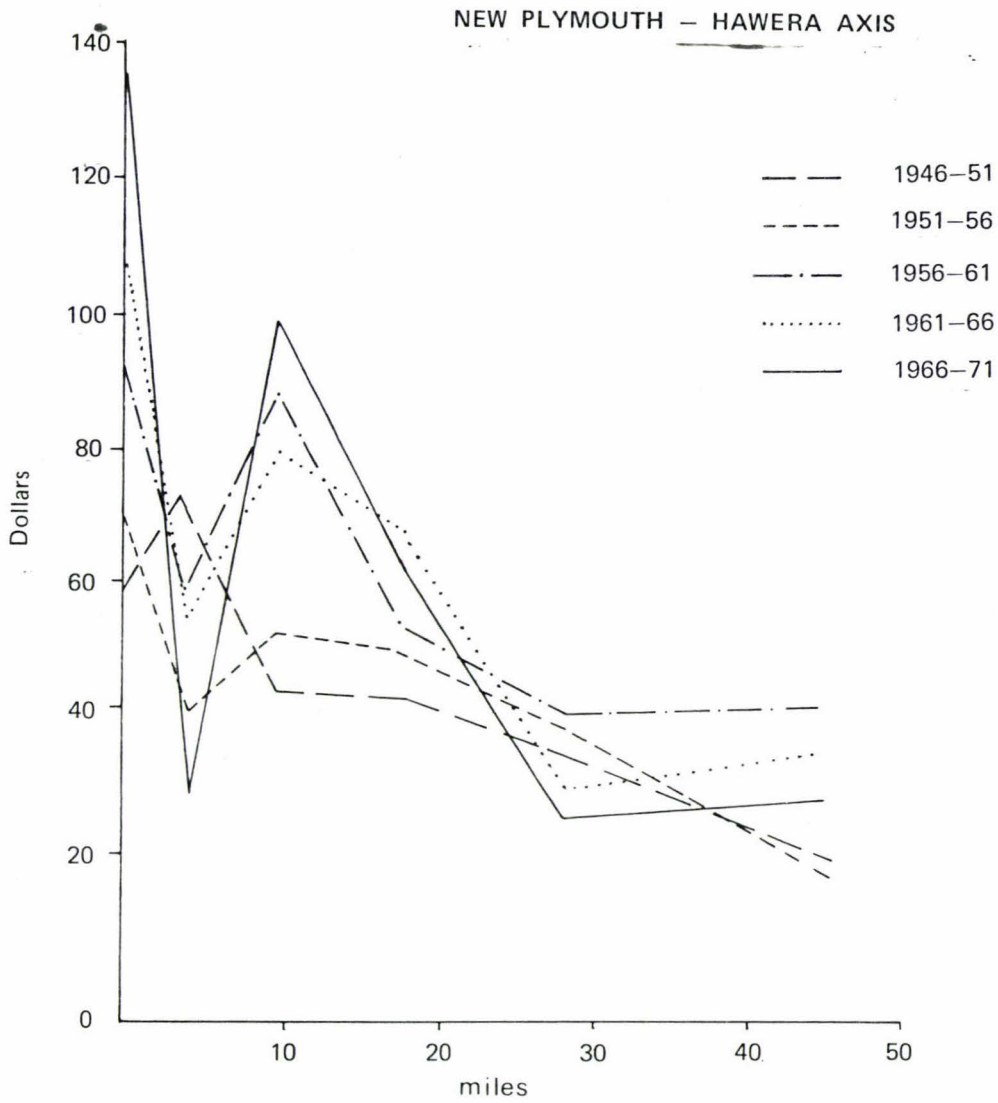


and Inglewood display declines. New Plymouth's expenditure percentage was the highest in 1946-51, but since then has declined. This could suggest that SOC components were established early on in New Plymouth's development, and since the post-war period, with urban growth, expenditure has been concentrated on EOC components, before that of new SOC components. Inglewood's pattern has already been suggested and the pattern that is shown in Figure 13 helps substantiate the suggestion put forward.

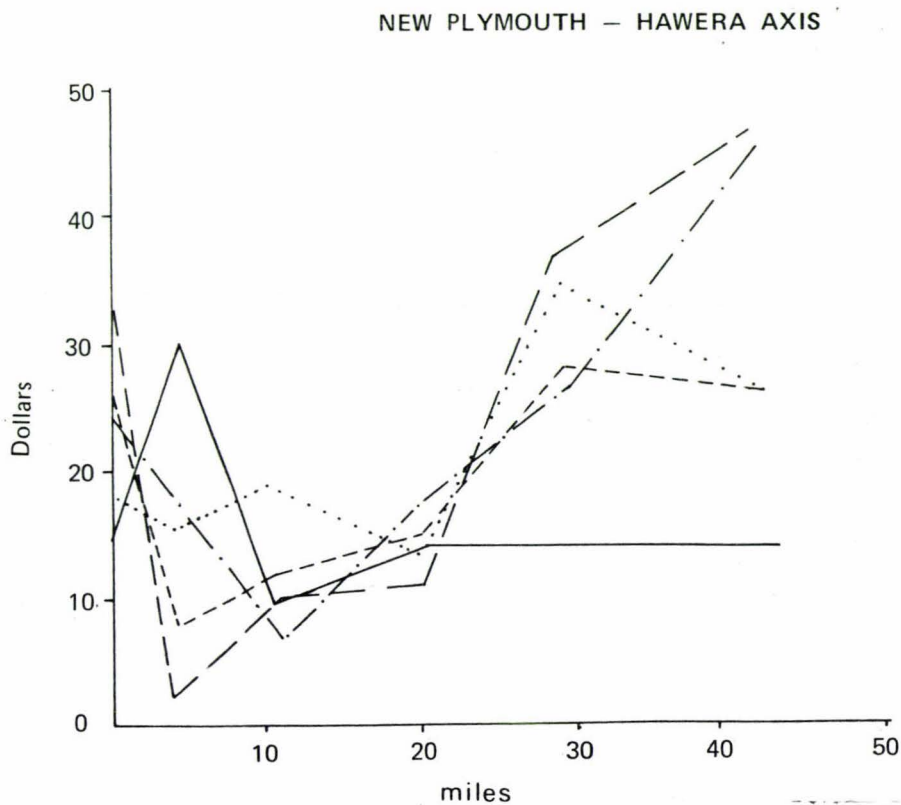
When comparing the expenditure to distance away from the regional centre, the pattern is one of a continual decline in urban per capita expenditure (Figure 14). This supports the hypothesis put forward that with distance away from the regional centre there would occur a decline in per capita expenditure. A possible explanation as to why this occurs could be that New Plymouth is the regional centre for Taranaki and as a consequence of this is attracting population and new industry at the expense of the other urban areas of the region. The urban areas adjacent to New Plymouth are possibly benefitting from New Plymouth's growth by way of overspill of population to cheaper living areas. This explains the reasonably high expenditure of Inglewood. As one moves further away from New Plymouth, the expenditure for urban areas drops, with a slight increase occurring at Hawera.

When examining SOC as percentage of OC in relation to distance, it is found that the urban areas furthest away from New Plymouth display the highest percentage, while those closer to the regional centre have a low percentage of total OC accounted for by SOC expenditure. (Figure 14). This helps to support the idea put forward that the urban areas closer to New Plymouth could possibly be experiencing an overspill effect, in way of population increase, and that more expenditure is required on basic EOC components. At the same time, the urban areas further away from New Plymouth are experiencing only slight population increases resulting in only small amounts of expenditure upon basic infrastructure (EOC components). Thus they are able to

MEAN REAL PER CAPITA EXPENDITURE COMPARED WITH DISTANCE:



PERCENTAGE OF OC ACCOUNTED FOR BY SOC COMPARED WITH DISTANCE:



spend more on SOC components, which helps in explaining the observed patterns in Figure 14.

METROPOLITAN CENTRES COMPARED WITH OTHER URBAN AREAS

The four major metropolitan centres in New Zealand were examined, and for each area:

1) A number of different regional centres mean per capita OC expenditure was examined to see whether OC varied as one moved further away from a metropolitan centre, and,

2) Mean per capita OC expenditure of urban areas within different population size groupings were compared with the metropolitan centres mean per capita OC expenditure.

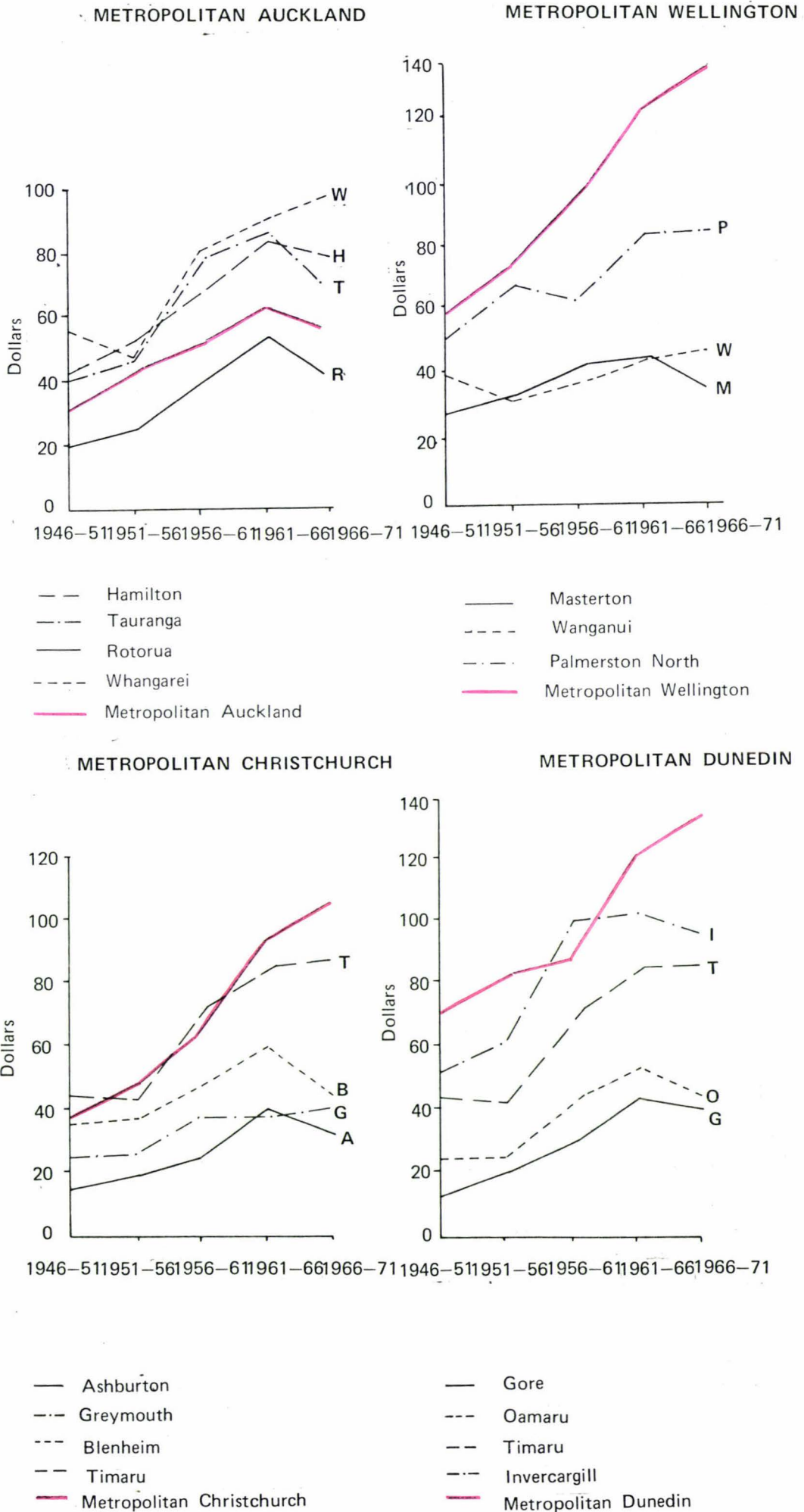
Auckland displayed the second lowest expenditure of the centres taken for the study of metropolitan Auckland. The only centre lower was that of Rotorua, and this could be explained by the fact that with two large centres within one region, it is likely that one will have the role of regional centre. In this case, it appears as if Tauranga, a port centre, fills this role, as it displays much higher expenditure overall than Rotorua. The highest expenditure is recorded by Whangarei, particularly in the last decade, which corresponds with a rapid growth in population for the city. The pattern that emerged, is one where the regional centres of surrounding regions to Auckland, displayed higher per capita expenditure than the metropolitan area itself.

This pattern, however, did not occur when Wellington, Christchurch and Dunedin were examined in a similar manner. In all cases over the last decade their expenditure has been increasing, while other regional centres have either stagnated or shown a decline in expenditure (Figure 15). Therefore, the Auckland metropolitan areas is the only urban area that displays a complete reversal of the pattern.

Why should this be so? It could be related to the fact that the northern half of the North Island has been, and still is, experiencing a rapid influx of people into the area. This undoubtedly adds strains

Figure 15

MEAN REAL PER CAPITA OC EXPENDITURE FOR CENTRES AWAY FROM:



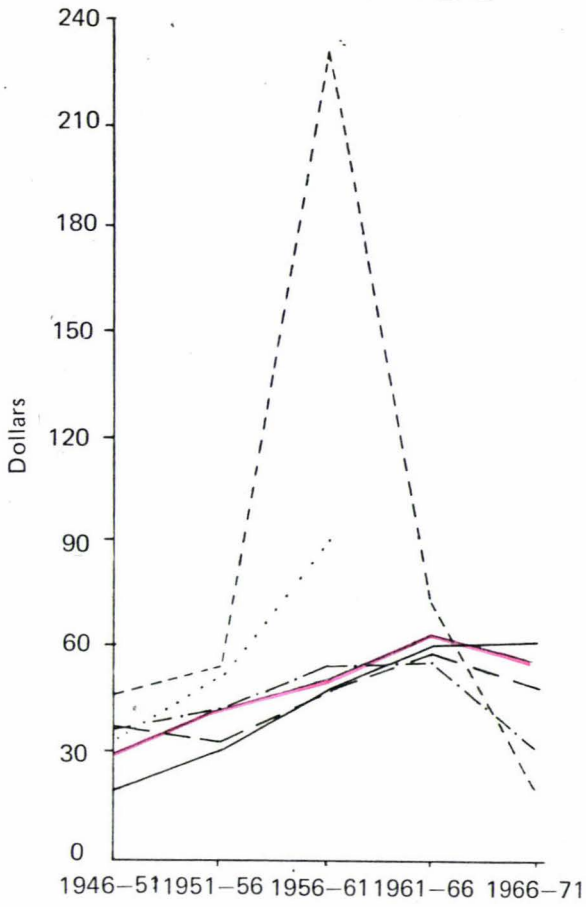
upon the urban areas of the region, particularly the larger urban areas where opportunities for jobs are brighter and thus attract the bulk of the people. Auckland has already been growing rapidly over a number of years and with this growth has built up a good basic infrastructure, while the regional centres in the adjacent regions have not, due largely to the fact that their growth rate in earlier years has been slower than that of Auckland, and it has only been over the past couple of decades that they have been experiencing rapid growth. Thus with the influx of people to the area, it became necessary to increase expenditure rapidly so as to provide basic infrastructure for an increasing population. Rather than extending onto old systems, as Auckland was able to do in many cases, whole new sewerage schemes, water supply schemes, and alike, had to be provided by these centres, thus the occurrence of higher per capita expenditure and an explanation of the observed patterns.

The possible factors for the other three metropolitan regions displaying higher expenditure than surrounding centres, is that these metropolitan areas represent the major growth areas for their region of influence, and thus require additional infrastructure, while the regional centres are more likely to be gaining people from the rural areas and smaller centres within it's region. At the same time a migration of people to the metropolitan areas occurs, thus giving the regional centres a slower rate of growth, which in turn relieves pressures upon existing infrastructure (Rowland, 1976).

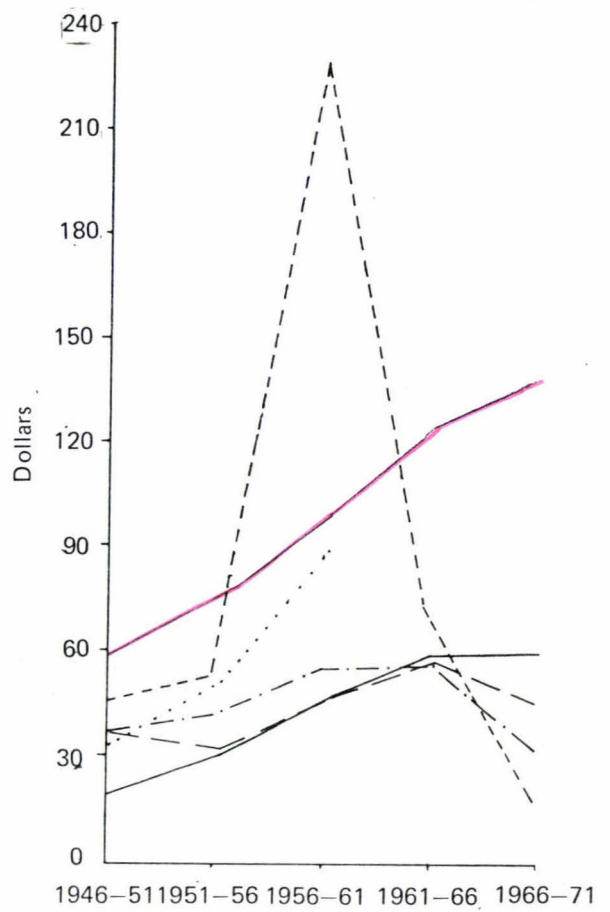
When the metropolitan centres were compared to urban areas within different population size groupings, Auckland's expenditure was very similar to all the different population size groupings, while the other three metropolitan centres displayed higher expenditure throughout the 25 year period (Figure 16). An exception does occur in the period 1956-61, when urban areas of 20,000 plus had a phenomenal increase in per capita expenditure, but rapidly dropped in the subsequent 10 year

MEAN REAL PER CAPITA OC EXPENDITURE OF DIFFERENT SIZED URBAN AREAS COMPARED WITH

METROPOLITAN AUCKLAND

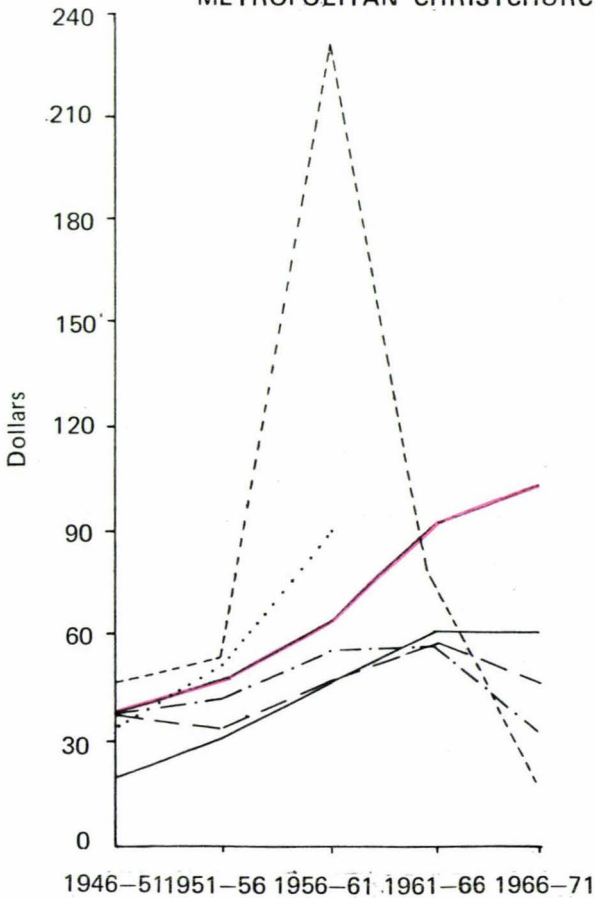


METROPOLITAN WELLINGTON

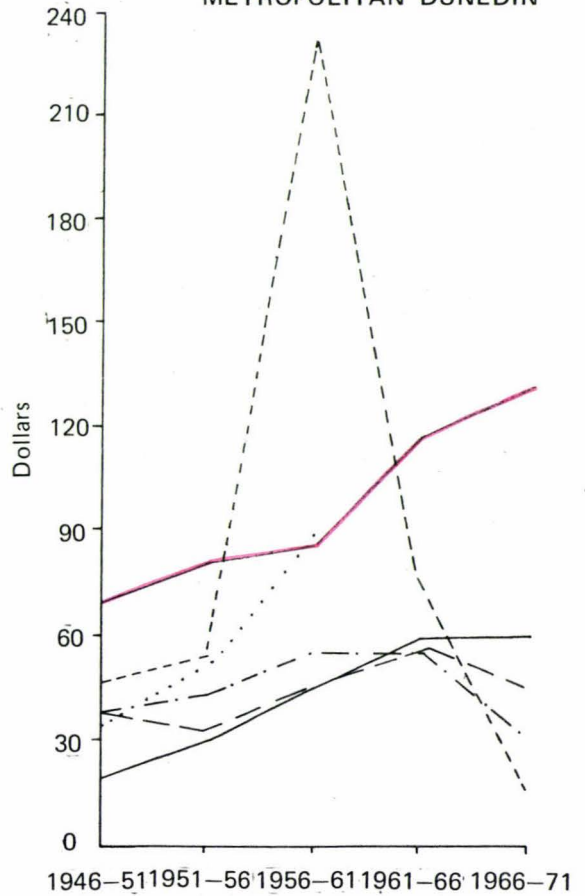


- 0-2500
- 2501-5000
- 5001-8000
- 8001-20000
- 20001 plus
- Metropolitan centre

METROPOLITAN CHRISTCHURCH



METROPOLITAN DUNEDIN



period to be the lowest per capita group in 1966-71.

Possible explanations as to why metropolitan Auckland's expenditure is so much lower than the other three metropolitan centres could be:

- 1) Auckland has already the required infrastructure to support further growth.
- 2) Auckland is adequately supplied with infrastructure components, or
- 3) Auckland is just unable to keep up with providing infrastructure, for the increase in population, due to lack of finance.

The other three metropolitan centres higher expenditure may be attributed to the fact that a high amount of expenditure is required on a particular infrastructure component, which does not occur in the case of Auckland. For example, Wellington and Dunedin have high expenditure on public transport and electrical and gasworks, Christchurch has high expenditure on electrical and gasworks, while Auckland experiences only very low expenditure on these components. The low expenditure of metropolitan Auckland could also be caused by the exclusion of the Auckland Regional Authority expenditures. The Authority expenditures was not taken into account as the area in which it has jurisdiction is different to that of the local authorities studied. However, the Authority controls expenditure on public transport, large roading, water, drainage and sewerage schemes throughout metropolitan Auckland, and as this is not accounted for within the local authorities which, for this study, constitute metropolitan Auckland, it is another possible explanation of why expenditure for metropolitan Auckland is lower than the other three metropolitan areas.

REGIONS AT DIFFERENT STAGES ECONOMIC DEVELOPMENT.

Of the five regions analysed, Auckland's urban areas display the lowest expenditure, while Wellington's are, overall, the highest. However Wellington is only just ahead of Taranaki over the 25 year period, while Southland displays a fluctuating pattern, but still

considerably higher than either Waikato or Auckland urban areas.

Figure 17
MEAN REAL OC EXPENDITURE FOR FIVE REGIONS AT DIFFERENT STAGES OF
ECONOMIC DEVELOPMENT



Source: Adapted from Local Authority Handbook

As seen in Figure 17, when taking real mean per capita expenditure, only Wellington and Taranaki show a continual increase, Waikato displays an almost static expenditure for 1966-71, after rising steadily from 1946-66, and Auckland and Southland show declines in expenditure for 1966-71 after rising expenditure had occurred for the period 1946-66, with a more rapid increase being displayed by Southland.

The findings of this analysis show that Auckland was the lowest expenditure of the five regions while being the most economically advanced region of the five studied. This is possibly due to the fact

that the region itself has been developing for over 100 years and over the last 50 years has been New Zealand's leading economic region. Compared with the other regions studied, Auckland has developed its urban system far earlier and consequently most of its basic infrastructure was established well before the post-war period, and that expenditure since 1945 has mainly been due to small additions to existing infrastructure, plus maintenance expenditure.

Waikato's expenditure was approximately \$10 per head higher for the first 20 years of the post-war period and in 1966-71 rose to \$20 per head of population above that of Auckland. The higher expenditure can be accounted for by Waikato's urban areas experiencing rapid growth with the move north and the overspill from Auckland, particularly the regional centre of Hamilton, and existing infrastructure, EOC components particularly, have proved inadequate to cater for the population increase. As a result new systems have had to be installed, and the expenditure is displayed in Figure 17.

The reasons for the high expenditure in the other three regions are more difficult to explain. Both Southland and Taranaki are priority regions, but this has only been bought into action over the last few years, so goes only a small way in explaining their higher expenditure. Both regions have experienced nett losses in population for certain time periods or only very slight increases for other periods, during the post-war years. So the increase in per capita expenditure suggests that these two region's urban areas are spending an extremely high amount of capital per head of population. For example, Taranaki's expenditure in 1966-71 was \$93 per head on infrastructure provision. The high per capita expenditure displayed by these two regions, suggests that infrastructure in both Southland and Taranaki urban areas has either,

- 1) been lacking in their early years of development and that since 1945 high expenditure has been necessary to bring acceptable infrastructure to the urban populations, or,

2) that these urban areas are spending an extremely high amount of capital overtime and that many components of infrastructure are being under-utilized.

Wellington's high per capita expenditure could be associated with the geographical nature of the area. The urban areas within Wellington are situated among a hilly terrain, and the cost of providing infrastructure to these areas would undoubtedly be higher than supplying them to a less undulating area, such as Auckland. New development in Wellington normally occurs in valleys or on the slopes of hills. Costs of building roads, supplying water and sewerage and alike are extremely high, compared with many other urban areas throughout the country. Therefore the geographical nature of the urban area could possibly explain the higher per capita expenditure experienced by Wellington urban areas (New Zealand Engineering, 1971, 247).

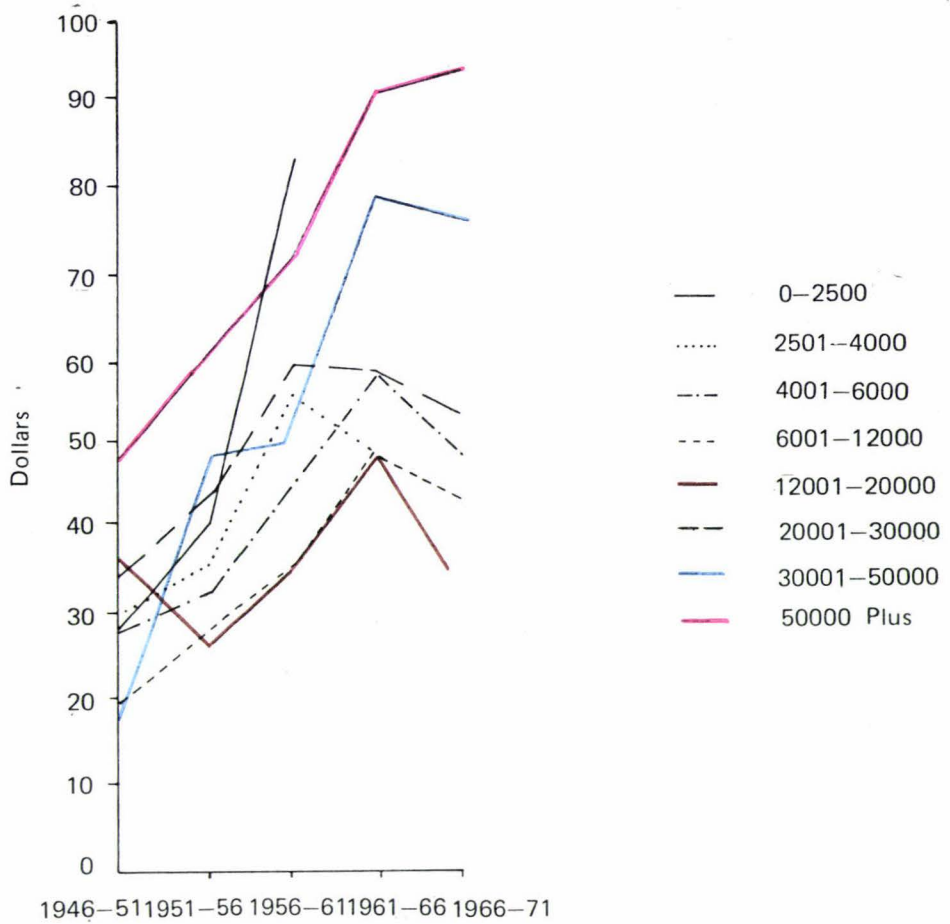
EXPENDITURE OVER TIME.

The population groupings, as used in section one, were taken, and the mean per capita OC expenditure was plotted for each five year period. Firstly, in taking actual expenditure, it was found that all but two population size groups experienced increased expenditures over the 25 year period. Of the two groups that did not increase in expenditure over the whole period, the most interesting is that of the 12,001-20,000 group. It displayed a pattern which showed a slight drop between 1946-56, then a marked increase to 1966, but once again dropped in 1966-71 by \$5-50 per head compared with the 1961-66 figures.

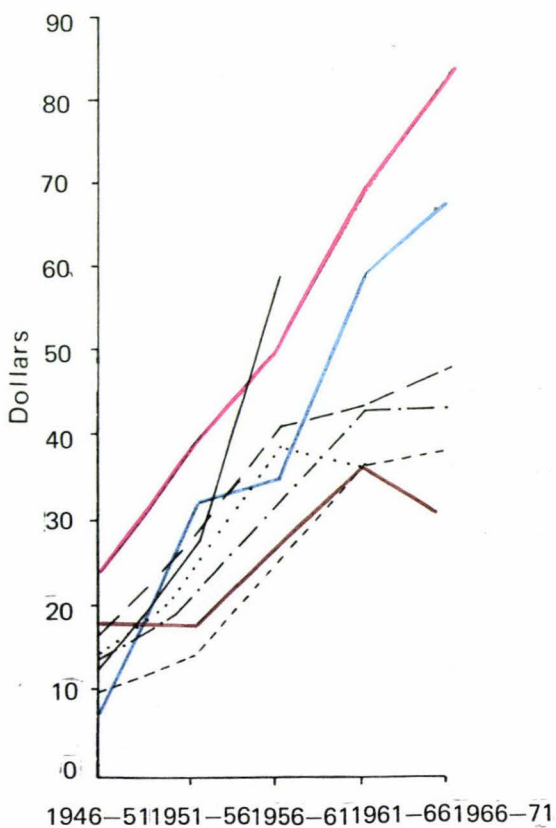
When real expenditure was examined, a dramatic change took place in expenditure for the majority of the population size groups. All except two displayed a drop in expenditure for the 1966-71 period. Figure 18 shows the expenditure for each population size group in both real and actual expenditure. The drops in expenditure are quite steep, ranging from \$2-00 to \$15-00 per head of population. Two interesting aspects arise when studying actual and real expenditure.

Figure 18

MEAN REAL PER CAPITA EXPENDITURE FOR DIFFERENT SIZED URBAN AREAS AGAINST TIME



MEAN PER CAPITA EXPENDITURE FOR DIFFERENT SIZED URBAN AREAS AGAINST TIME



Firstly the 20,001-30,000 group, in actual expenditure, displays a continual increase, but when looking at real expenditure, the highest per capita expenditure is reached during 1956-61. From that point onwards, a decline, only slight for the first five years, but then more steadily for the final five years occurs.

Secondly, as before, the 12,001-20,000 group represents the most dramatic decline in expenditure for any population group. In fact the group has two periods in which declines occur. The first occurs in 1951-56 where the group drops from the second highest expenditure to the lowest. From 1956-66, there is a continual increase in expenditure, from \$26 to \$50 per head, but in 1966-71 another rapid downturn in expenditure occurs to \$35 per head. As has been found earlier, this population group tends to fluctuate in expenditure, but always shows a decline over the 1966-71 period.

SOC AS A PERCENTAGE OF OC RELATED TO POPULATION DENSITY.

Table 3 is a summary of the results obtained from analysing population density groups for SOC as a percentage of OC expenditure, and shows that no distinct pattern emerges. These findings completely run opposite to those of Hansen's (1965) study in East Flanders. He stated that with increased population density there was a marked upward trend in SOC, and that there was a clear tendency for the proportion of OC accounted for by SOC to increase with density. With respect to the latter part of the statement, this pattern does not occur for New Zealand urban areas, in fact, if anything there is a complete reversal to what Hansen postulated.

Hansen also suggested that in general, density had a greater effect on SOC, than did absolute population size, but this too was found not to be the case for New Zealand. When urban areas of the North Island and South Island were examined for both SOC and EOC expenditure, it was found that SOC expenditure did increase with population size, and that the highest SOC expenditure was found in

TABLE 3

SOC as a Percentage of OC Expenditure For Different
Population Density Groups 1946-71.

Population per hectare	1946-51 SOC %	1951-56 SOC %	1956-61 SOC %	1961-66 SOC %	1966-71 SOC %
0 - 4	9.6	14.6	17.7	18.0	
4.1 - 5.0	9.1	10.2	12.2	15.9	20.9
5.1 - 6.0	23.9	14.5	23.0	12.9	18.9
6.1 - 8.0	14.9	13.0	17.7	17.4	14.9
8.1 - 9.0	12.4	13.0	16.4	8.9	15.9
9.1 - 12.0	32.0	17.4	16.8	19.6	15.5
12.1 - 15.0	19.8	29.3	16.6	15.3	19.8
15.1 - 40.0	34.5	30.0	29.4	24.3	24.0

Source: Compiled from Local Authority Handbook

urban areas of 20,000 plus in population.

Thus the findings of this study run contrary to the findings of Hansen's study in East Flanders. The origins of the different relationships between SOC as a percentage of OC expenditure and population density, could be due to the fact that East Flanders is in total area, relatively small, while the number of municipalities per unit area is very high. Population density is rather high, as within the 297 municipalities of East Flanders, over 95 per cent of the provinces population is found. New Zealand urban areas, on the other hand, are far more geographically spread, and population density is nowhere near as high as it is in the highly industrialised province of East Flanders. These factors help to explain why a reversal in the pattern found in East Flanders occurs for the New Zealand urban system.

Chapter 5

CONCLUSION

This thesis has been an introductory study looking at local authority expenditure on various components of infrastructure. In the study, different ways of examining such information were used, so that a wider, more comprehensive coverage could be obtained. As this has only been an introductory study, many questions have arisen from the research that are left unanswered. Only further research in this field will enable a better understanding of infrastructure provision.

From the research, a number of limitations are revealed, as a consequence of the approach adopted. By using local authority expenditure, the findings are limited to the local government sector and do not take into account central government expenditure on infrastructure. As a result of this, only eight components of infrastructure were able to be studied, while other components, such as education, health and justice, which rely heavily on central government expenditure, were not included. The decision to take towns of 5000 plus in population (1971 Census), meant a large number of urban areas were excluded from the study and this debarred a full coverage of urban areas. As well as the above limitations, the choice of the 25 year period (1946-1971), made it impossible to gauge the amount of infrastructure provision already found within the urban areas under study, particularly the larger towns. Therefore low expenditures in these areas may have arisen due to prewar expenditures.

Nevertheless, the New Zealand wide approach of the study has given a general picture of expenditure on infrastructure overtime on different sized urban areas. This approach has allowed a more comprehensive coverage and indication of general infrastructure expenditure trends of local authorities found within the New Zealand urban system. As well as this, the study has been conducted within a new area of research with respect to New Zealand urban geography and has opened up

new avenues in which further research can be undertaken.

As this constitutes an introductory study to a wide topic, it was decided to put forward a number of basic suggestions that were related to an overseas study. The first of these proposals was that OC, especially EOC, was directly related to population. However, the findings from the research generally ran contrary to this proposal. Instead of EOC increasing for each different population sized urban area, it actually decreased, so that the smaller urban areas experienced high mean per capita expenditure, while the larger urban areas had low expenditures. For example, the towns within 0-2500 population experienced \$9-00 to \$21-00 per head of population for the component of bridges, roads and footpaths over the 25 year period, while urban areas of 50,001 plus went from \$6-20 to \$18-70 for the same period. Other examples of this decrease in expenditure occurred, with the exception of the electrical and gasworks component. Here a decrease occurred for the smaller urban areas, but for areas of over 30,000, there was a marked increase in expenditure over the post-war period. For example the 30,001-50,000 sized urban areas rose from \$0-00 to \$37-00 per head over the time period examined.

However, even though the pattern of electrical and gasworks expenditure showed an increase with increased population, the hypothesis was not supported, due to a decrease in EOC expenditure with an increase in population. This pattern of decreasing expenditure with increasing population size again fails to sustain the findings of Hansen (1965) who argued that with increased population EOC would tend to rise.

Even when EOC was examined as a category, and not as separate components, the same pattern tended to emerge, although it was not as clear as that for each component. Fluctuations did occur when taking North Island urban areas, with a marked drop in expenditure in 1966-71, particularly in the higher populated urban areas. South Island urban

areas, however, did display an increase in expenditure with increased population size of urban areas.

These conclusions show that meaningful generalisations cannot be made to cover all communities. Special problems arise, at both ends of the population range as well as between South Island and North Island urban areas which generally require separate attention. Unfortunately, due to the approach of this thesis, it was not possible to investigate these special problems that arose.

When taking SOC expenditure, the general pattern was one of an increase in expenditure with increased population size, the proposal put forward in hypothesis two. Both when looking at separate components or when taking SOC as a category a rise occurred. The most noticeable increase occurred in the recreational facilities component, which steadily increased with increased urban size. Possible reasons behind this higher per capita SOC outlay with increased population size are many. It could be a reflection of the social cost of over-concentration of population or merely the fact that there are higher demands made by people living in larger urban areas for social investments. Whatever the forces behind the higher SOC investment, it can be said that larger populated urban areas are associated with higher per capita public SOC investment costs.

When taking the proportion of OC accounted for by SOC, the findings from the New Zealand urban areas once more differed from Hansen's assertion that the proportion would increase with a rise in population density. No definite pattern emerged, with most population density groupings displaying a fluctuating pattern, with only the lowest two groupings showing a continuous increase over the time period. Even though the highest density group had the highest proportion of OC accounted for by SOC, it showed a continuous decrease over the post-war period, from 34 per cent to 24 per cent. Thus hypothesis three was not supported by this examination of the New Zealand urban system.

Hypothesis four put forward the proposal that OC would vary away from key metropolitan areas. As was the case with hypothesis one, no indication was given to what pattern should emerge, whether the metropolitan centre would display the highest or lowest expenditure compared with the other centres. It was, however, generally accepted that the metropolitan areas would display the highest expenditure of all the urban areas studied. After studying the four major metropolitan areas of New Zealand, a situation occurred where two completely opposite patterns were discovered. The centres around metropolitan Auckland all display except one, a higher expenditure per capita than Auckland, while the other three metropolitan centres display higher expenditure than their surrounding regional centres. It has already been suggested earlier, why this pattern might occur, but it is an area in which further research could take place, so as to ascertain the causal influences generating such a pattern. From the findings, however, the proposal put forward is supported even though the findings of Auckland run contrary to expected results. The other three centres all display similar patterns, while Auckland provides a unique case for New Zealand metropolitan areas.

When looking at the metropolitan centres compared to different sized urban population groupings, Auckland featured a low expenditure, such that it was placed among much smaller population size groupings. The other three metropolitan centres displayed the highest expenditures. These findings supported those found when studying regional centres away from metropolitan centres, therefore supporting the hypothesis put forward.

The Taranaki region was studied, to see whether there existed a form of hierarchial expenditure between the urban areas of the region. The study findings substantiated the suggested pattern expected with hypothesis five. In fact from the findings it was found that there was an even larger discrepancy in expenditure between the regional centre

and those centres furthestest away than what was originally thought. The difference between New Plymouth and Hawera in 1966-71 was \$100 per head of population, and at no time during the post-war period was the difference lower than \$50 per capita. Further research into other regions urban areas would help to establish whether this pattern continues to occur in other regions, or whether it is unique to the region of Taranaki.

Throughout the study, there occurred a consistent pattern for one particular population grouping. When expenditure for towns of 8,000 to 20,000 was examined, there always occurred a downturn for the final five year period of 1966-71. When studying the North Island - South Island urban areas, both island's urban areas within this size grouping displayed a downturn for total OC during 1966-71. The only time an increase in expenditure was recorded during this time, was when SOC expenditure for North Island - South Island urban areas was examined. South Island urban areas showed an increase, while North Island urban areas continued to decline. An explanation for why this downturn should have occurred has already been argued, and whether it is a general influence, only time will tell. As an unexpected discovery, it invites further investigation as to the determinants of future infrastructure expenditure for these sized urban areas.

Thus this thesis set out to explore the nature of variability in local authority expenditure on infrastructure. It has accomplished this task within the limitations of the data set, but in doing so, has opened up many new avenues and posed new questions. One avenue in which further research could take place is in the comparison of local authority expenditure with that of central government, so as to see what impact, if any, central government infrastructure expenditure has on the patterns found in different sized urban areas in this study.

WHOLESALE PRICE INDEX AND PRICE DEFLATORS

<u>YEARS</u>	<u>PRICE DEFLATOR</u>	<u>AVERAGE PRICE DEFLATOR FOR FIVE YEAR PERIOD 1946-51</u>
1946-47	414	
1947-48	462	
1948-49	458	.4828
1949-50	499	
1950-51	581	<u>1951-56</u>
1951-52	645	
1952-53	639	.6442
1953-54	633	
1954-55	640	
1955-56	664	
1956-57	672	<u>1956-61</u>
1957-58	692	
1958-59	702	.6944
1959-60	704	
1960-61	702	
1961-62	698	<u>1961-66</u>
1962-63	711	
1963-64	759	.7420
1964-65	767	
1965-66	775	
1966-67	776	<u>1966-71</u>
1967-68	834	
1968-69	879	.8824
1969-70	923	
1970-71	1000	Base year: 1971=1000.

Source: Adapted from 1966 and 1975 Official Year Book.

APPENDIX 2POPULATION SIZE CLASSES 1946-71

Number of towns found within each population group over 25 year period

Population	1946-51 ¹	1951-56	1956-61	1961-66	1966-71
0 - 2500	9	7	4	-	-
2501 - 4000	14	14	10	3	-
4001 - 6000	9	7	11	16	13
6001 - 12000	12	16	16	18	22
12001 - 20000	7	9	10	10	8
20001 - 30000	6	6	6	9	10
30001 - 50000	1	4	4	4	6
50001 plus	4	4	4	5	6

Note: (1)

Only 62 towns are recorded for 1946-51 because three towns had either not reached borough status or were absent from the Local Authority Handbook.

Source: Compiled from Official New Zealand Year Book

APPENDIX 3BOROUGHS INCLUDED IN METROPOLITAN AREASMetropolitan Auckland

Helensville
 Henderson
 Glen Eden
 New Lynn
 Takapuna City
 Devonport
 Northcote
 Birkenhead
 Auckland City
 Ellerslie
 Mt. Albert
 Mt. Roskill
 Mt. Eden
 Newmarket
 Onehunga
 One Tree Hill
 Otahuhu
 Howick
 Papatoetoe City
 Papakura
 Pukekohe

Metropolitan Wellington

Wellington City
 Petone
 Lower Hutt City
 Upper Hutt City
 Eastbourne

Metropolitan Christchurch

Kaiapoi
 Riccarton
 Christchurch City

Metropolitan Dunedin

Dunedin City
 Mosgiel
 Green Island
 St. Kilda

APPENDIX 4POPULATION SIZE CLASSES 1946-71

North Island: Number of towns within each population group

Population	1946-51	1951-56	1956-61	1961-66	1966-71
0 - 2000	1	1	1	-	-
2001 - 5000	2	2	2	1	1
5001 - 3000	2	3	2	3	3
8001 - 20000	3	3	4	3	3
20001 - 30000	1	2	2	2	2
30001 plus	1	1	1	1	1

South Island: Number of towns within each population group

Population	1946-51	1951-56	1956-61	1961-66	1966-71
0 - 2000	1	1	1	-	-
2001 - 5000	2	2	2	1	1
5001 - 8000	2	3	2	3	3
8001 - 20000	3	3	4	3	3
20001 - 30000	1	2	2	2	2
30001 plus	1	1	1	1	1

Source: Compiled from Official New Zealand Year Book

APPENDIX 5POPULATION DENSITY CLASSES 1946-71

Population density: towns within each density category

Population/ _{km²}	1946-51	1951-56	1956-61	1961-66	1966-71
0 - 4.0	10	4	4	3	-
4.1 - 5.0	5	6	4	3	3
5.1 - 6.0	5	6	5	3	2
6.1 - 8.0	10	7	7	11	8
8.1 - 9.0	3	7	5	2	3
9.1 - 12.0	11	11	10	14	15
12.1 - 15.0	6	10	14	10	11
15.1 - 40.0	12	13	16	19	23

Source: Compiled from Official New Zealand Year Book

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