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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~~^{erone} 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).

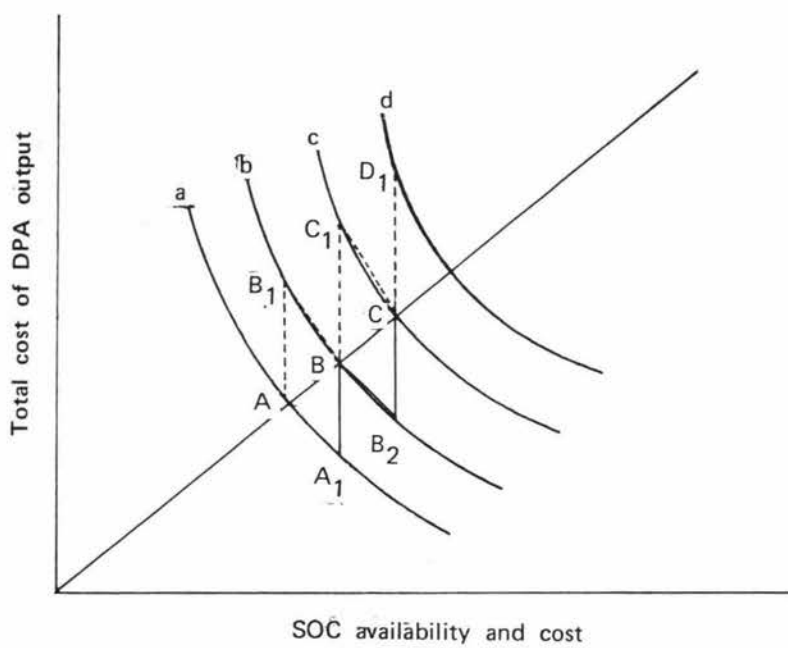
From what has been stated, it could be argued that infrastructure is important as a determinant of growth. It has been seen as a prerequisite to stimulate growth and without it growth would not occur.

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.

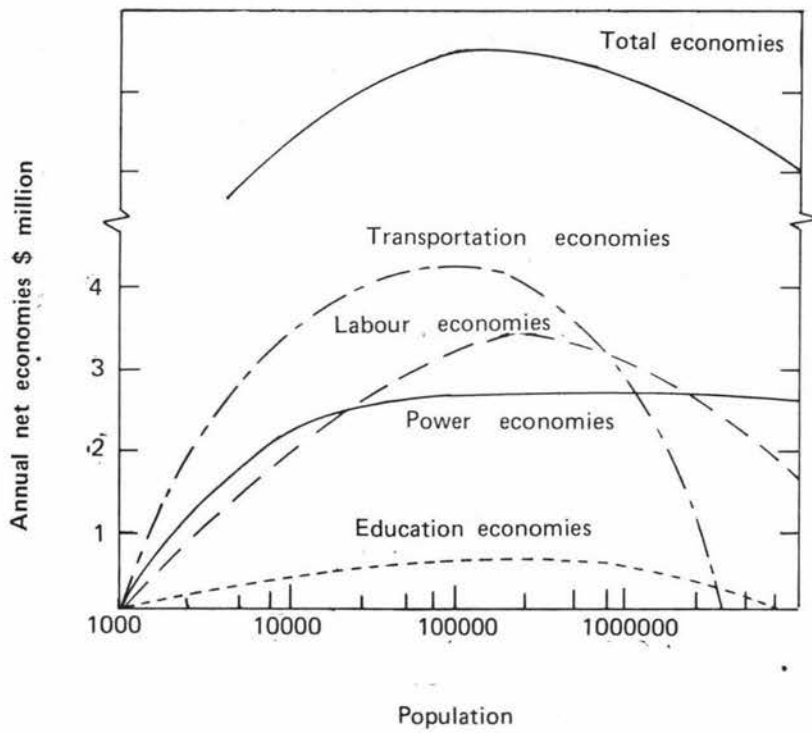
From Figure 1, one can visualise two principal types of sequences. One that starts expansion through increases in the supply of SOC, shown in the figure by the fat line connecting AA_1 BB_2 C and the second sequence where the initial expansionary step is always taken by DPA, indicated in the figure by 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.