

# United Nations Conference on Human Settlements



NEW ZEALAND  
NATIONAL REPORT

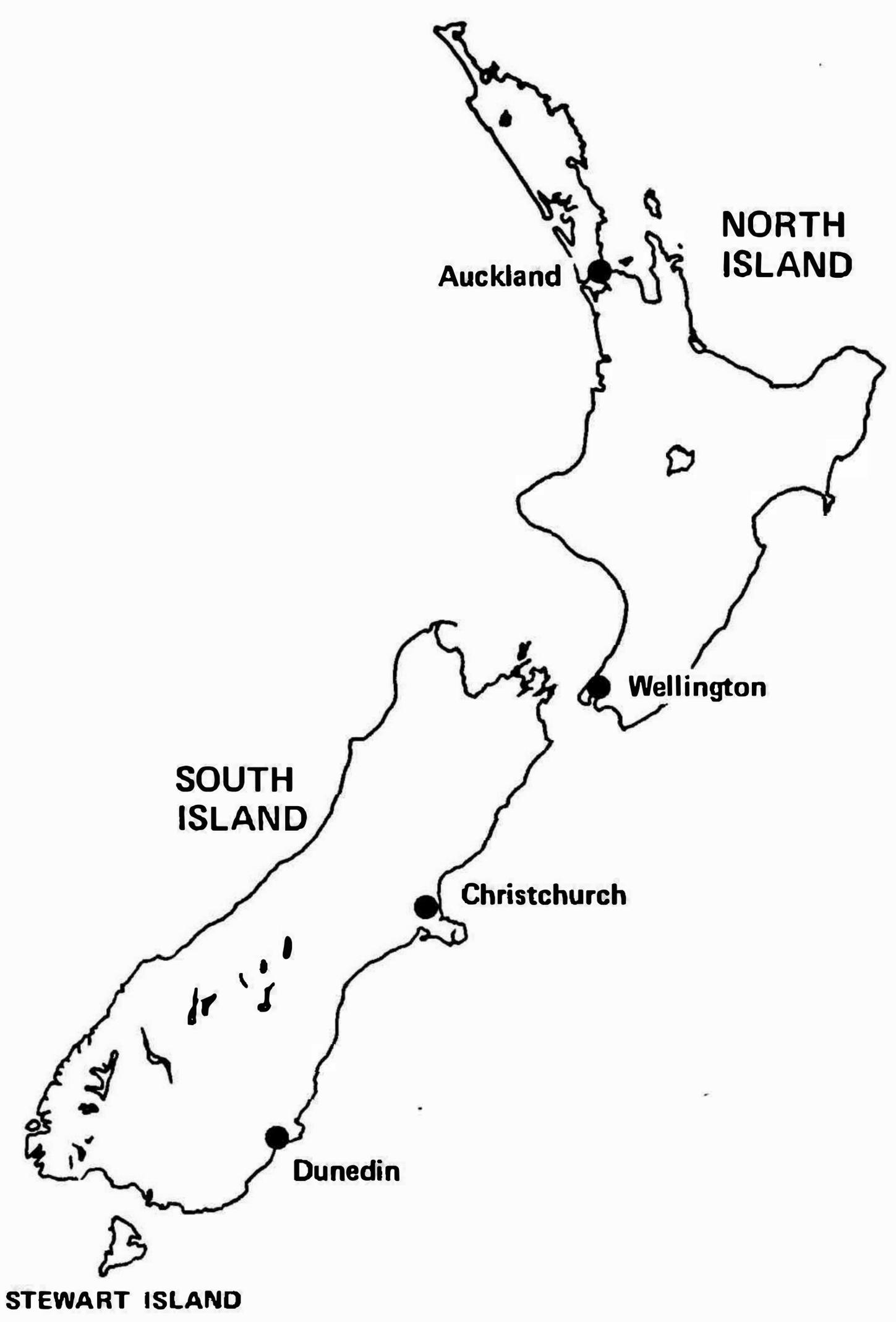
**UNITED NATIONS CONFERENCE  
ON HUMAN SETTLEMENTS**

**NEW ZEALAND NATIONAL REPORT**

**Published by the  
Commission for the Environment  
in co-operation with the  
Town and Country Planning Division  
Ministry of Works and Development  
April 1976**

## CONTENTS

INTRODUCTION	5
CONTENT OF REPORT	7
TRADITION OF TIMBER CONSTRUCTION	8
ESTABLISHMENT OF EXOTIC FORESTS	10
SPECIES	11
PRODUCTION	12
PRIVATE EXOTIC FOREST DEVELOPMENT	14
TIMBER TREATMENT AND PRODUCTS	14
HOUSE PREFABRICATION	19
LAND TENURE	20
FINANCE FOR HOUSING	21
STATE-PROVIDED LOW RENTAL ACCOMMODATION	22
PLANNING IN NEW ZEALAND	23
NEW ZEALAND AND HABITAT	24



**NORTH  
ISLAND**

**Auckland**

**Wellington**

**SOUTH  
ISLAND**

**Christchurch**

**Dunedin**

**STEWART ISLAND**

## **INTRODUCTION**

New Zealand is located in the South Pacific between the latitudes of 34° and 47° south. It is comprised of two main islands and several smaller islands, with a total area of 26.87 million hectares. Much of the country is mountainous and 50 per cent lies over 1,000 metres above sea level, while only 30 per cent has easy rolling to flat terrain.

Overall the climate is temperate, and because no part of the country is further than 121 kilometres from the sea there is a strong maritime influence.

The first organised European settlements were in 1840, and by March 1975 the population had risen to 3.1 million, approximately equivalent to that of Sydney, Australia, or Birmingham, United Kingdom. Of this number, approximately 250,000 are descendants of the original Polynesian inhabitants, the Maoris, and a further 40,000 are recent arrivals from the six principal Pacific Islands with a degree of economic dependence on New Zealand.

Most other New Zealanders are descendants of British immigrants, but the population includes immigrants and descendants of immigrants from other European countries and from Asia.

New Zealand is highly urbanised. In 1971, 45 per cent of the population lived in settlements exceeding 25,000 inhabitants, while a further 29 per cent lived in areas with between 1,000 and 25,000 inhabitants, giving an urban population of 75 per cent of the total.

The largest city is Auckland, which has a population of 750,000 and occupies a greater land area than London. The Polynesian content of its population is sufficient to make Auckland the largest Polynesian city in the world.

New Zealand's relatively satisfactory economic position is mainly attributable to agriculture based on grasslands production. The national community is more egalitarian than most, the difference in living standard between the least and most affluent being smaller than in most other countries.

Early organised settlement was influenced by social idealism and most settlers sought escape from the oppressive conditions of Victorian Britain and betterment of their circumstances by reliance on their own resources. A result of this national attitude has been the pioneering of social legislation throughout the country's short history.

Although the national population is not large in relation to land area, it is one which has grown rapidly, particularly in the period after World War II.

Of the 850,000 dwellings in the country, over 400,000 have been constructed since 1953. In 1974 32,600 were built. The census of 1971 indicated that 70 per cent of all dwellings were owner-occupied and approximately 90 per cent of new dwellings were built for private owners; most of the remainder being erected by Government agencies for rental purposes.

Most New Zealand towns have public water supplies and 84 per cent of the population is serviced by a piped public water supply. In 1972, 62 per cent of the population was serviced by sewage treatment plants, 19 per cent by sea outfalls, and the remaining 19 per cent by septic tanks. Until 1970, much urban development proceeded on the basis of household septic tanks for sewage disposal.

The subsequent high costs of sewerage such areas diverted funds from the provision of treatment facilities and other environmental health services. Now, housing development on the basis of septic tank drainage is discouraged because of the increased pollution of the subsoil water caused by such a sewage disposal method. The provision of these facilities has been assisted by Government through various national policies.

Urban development has tended to take the form of vast suburbs, rather than true cities, as almost every family lives in its own house occupying a relatively generous plot of land. This detached style of living, coupled with low occupancy rates (3.38 occupants per dwelling in 1971), has meant that the population densities of urban areas in New Zealand are comparatively low by international standards.

A consequence of the population growth, individual housing, and low occupancy rate has been a constant high level of demand for the provision of new, good quality housing.

Almost 5 per cent of the GNP and between 24 per cent and 27 per cent of the gross domestic capital formation is absorbed by residential construction, and this is an indication of the high priority New Zealand society accords to the provision of suitable accommodation.

A suburb near Auckland,  
designed to accommodate a further  
4,000 houses and a new town centre.

## CONTENT OF REPORT

In accordance with the guidelines set out for national reports, the emphasis of the New Zealand report has been placed on an aspect of national development which has contributed successfully and substantially to the attainment of a good standard of housing in a small country of modest economic achievement. It is related particularly to a period which, in terms of the country's history, was one of crisis in its housing situation.

The report postulates that New Zealand's timber resource was a dominant element in the process of recovery. Timber has traditionally been one of the main building materials used in the country and at the time of greatest need was obtained economically, with the aid of some degree of medium-range forward planning, from a natural but exotic crop, suited to the country's climatic and topographical conditions.

Some additional factors relating to the establishment and expansion of human settlements in New Zealand are also mentioned briefly.



# **New Zealand's reliance on timber for housing**

## **TRADITION OF TIMBER CONSTRUCTION**

From an early stage in New Zealand's settlement by Europeans, which began about 150 years ago, houses have been built mainly of timber. The practice was undoubtedly encouraged by the abundance of exceptionally good timber trees in the native forests which once covered much of the country. The value of the forest was quickly recognised and the timber was soon put to use initially for ships' spars but later, as settlement became more advanced, for many domestic purposes.

For over 100 years several native timbers, suitable for ground-contact use, framing, joinery, decorative purposes, and even roofing shingles, were freely available and cheap. Though these circumstances favoured the development of building in wood, they led to waste in extraction from the forests, in conversion of logs to timber, and in applications of high-quality material in house construction.

Large areas of forest were removed by felling and burning, without any recovery of wood, to clear the land as quickly as possible to establish pasture for the grazing of farm animals. Consequently, wood resources were rapidly depleted and there was virtually no restoration of the indigenous forest because this was known to be difficult, and the forest very slow growing.

New Zealand entered into its greatest period of urban growth from the end of the 1939-45 war. At that point native timber resources were approaching depletion and the demand for building, particularly of residential accommodation, was probably the greatest in the country's history.

This was brought about by the effects of the years of low production during the economic depression of the late 20s, and of the war period. Added to this was a high rate of family formation following the war and the impact in New Zealand of the world-wide acceleration in urban growth.

The tradition of construction in timber and the overwhelming predominance of housing in the form of single-storey detached dwellings, each on its own defined land parcel, resulted in a enormous demand for timber and timber-based building material. It was fortunate that the country had a large maturing exotic timber resource available for development to meet this demand.



Mangatu Forest, North Island. Radiata Pine — twelve years' growth

## **ESTABLISHMENT OF EXOTIC FORESTS**

Although it was fortuitous that the first large area of exotic forests had matured at the time of the demand of the post-war years, their availability was not unplanned. The ultimate depletion of indigenous timber resources had been foreseen well before 1900.

The need to conserve and manage what then remained and to provide for future requirements by programmed plantings of faster-growing species had led, in 1896, to the formation of an Afforestation Branch of the Lands and Survey Department. Under this administration, forest tree nurseries were established and planting began in 1898. Progress was slow until 1922, by which time 19,000 hectares of forest had been established.

The formation of the New Zealand Forest Service as a separate Department of State in 1919, indicative of the increasing importance being placed by Government on afforestation, was accompanied by a surge in activity which resulted in 152,000 hectares being planted during the period 1923-36.

Thus, the early establishment and implementation of an afforestation policy was particularly well timed in that a large, mature, exotic timber resource was available in the period of New Zealand's greatest need for timber. There was a readily available supply and an organised planting programme with the capability for expansion to meet a growth in demand.



**Radiata pine seedlings in South Island nursery.**



Assessing height growth at Forest Research Institute nursery.

## **SPECIES**

Prior to 1896, Government had established nurseries to raise indigenous and exotic forest trees to encourage tree planting by private interests. With the introduction of a policy for the establishment of State exotic forests, trials were made of many species for adoption over a wide range of site, location and climate.

After extensive testing, it was found that radiata pine, which showed the ability to grow rapidly on a wide range of sites and to produce fine stands of timber, was most suitable for New Zealand conditions. Accordingly, it became, and still is, the major exotic conifer of New Zealand. Other major species planted according to site, are Douglas fir, Corsican pine and Ponderosa pine.

In recent years the southern pines — loblolly, slash, and long-leaf pines — have found a place in the more northerly forests. Minor species planted on a restricted scale are larch, lodgepole, strobus, patula pines, Japanese cedar, Lawson cypress, macrocarpa, and western red cedar.

## **PRODUCTION**

Not only was there available, when most needed, a resource in mature forest, but production of timber was well established. Although this activity was at an early stage of growth, it had already proved successful and the testing of processes and products, and the experience gained, provided a basis from which expansion could be planned and undertaken.

Sawn radiata pine timber had been produced for many years in New Zealand, mainly from shelter-belt trees, but this amounted to little more than a token quantity. By the late 1930s, logs of radiata pine from the older State and private plantations were brought into production for packaging, boxing, and rough building. Although radiata pine produced more than 10 per cent of the total rough-sawn timber output, it remained in low regard relative to indigenous timber as it was considered inferior in terms of appearance, durability and strength.

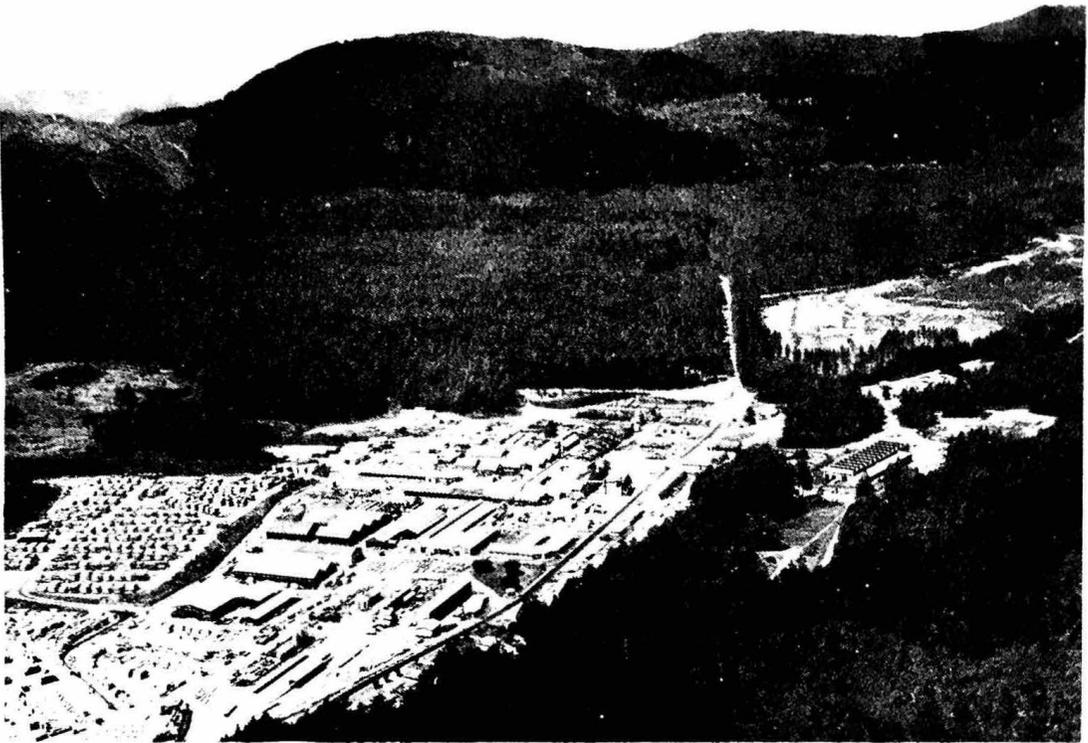
Forest planning had, however, included provision for entry by the State into sawmilling and the marketing of an acceptable timber product. The most important implementation of this planning had been the commissioning of the Waipa State Sawmill in 1940, through which the Forest Service introduced new equipment and methods.

These included safety headgear, short fast-cutting Swedish cross-cut saws for use on small timber, Swedish barking knives for post and pole peeling, light, fast, stationary hauling equipment, mobile loading gear, heavy-duty log trucks and trailers, mechanical saws of various types, safety stakes on log transport vehicles, and back-loading of trailers.

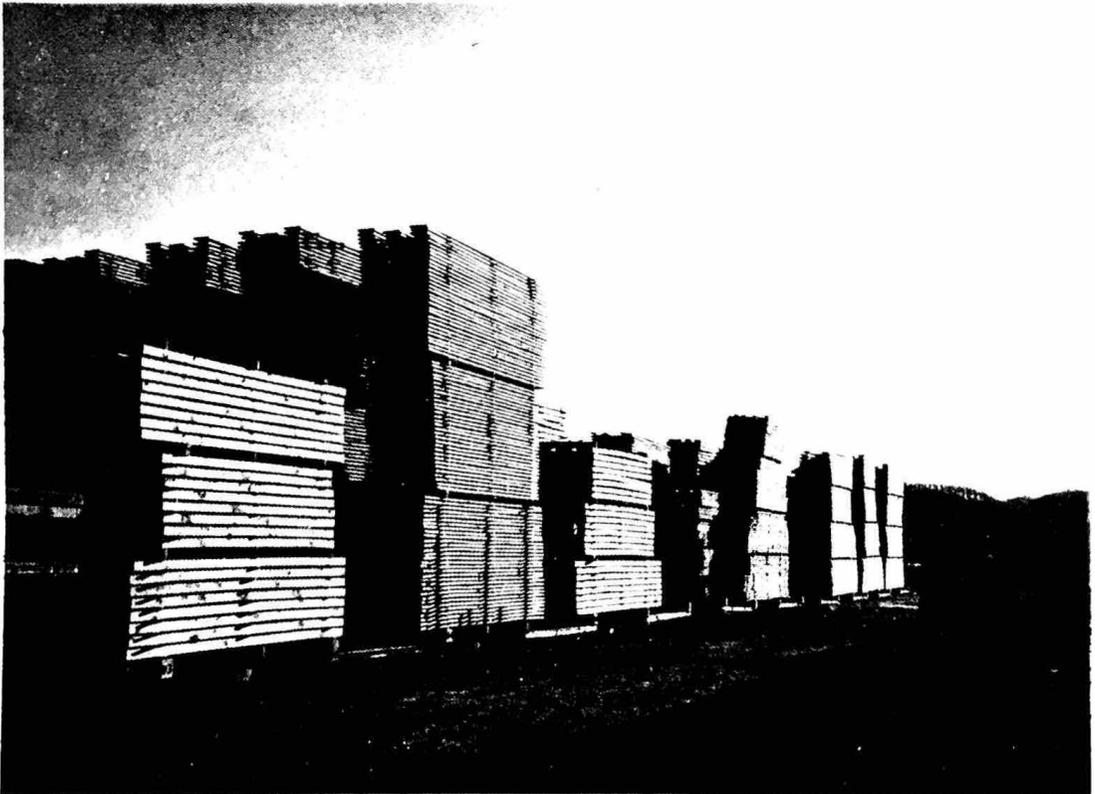
The logging, sawing, and marketing techniques initiated by the Forest Service and freely made available to others have earned no small measure of credit in the success story of New Zealand exotic forestry. In particular, the satisfactory service radiata pine timber gave in wartime advanced by many years the widespread acceptance it quickly gained thereafter.

There has been a continuous growth in exotic forestry in New Zealand, to the extent that there has been a surplus of forest products available for export. This has become increasingly important to the country's economy in terms of overseas trade.

Plantings of State exotic forest have increased to a current annual level of 27,400 hectares at March 1975, providing a total stocked area at that date of 371,200 hectares. For the same year, total removals of exotic wood from State forest were 3.7 million cubic metres. The planting target for the next decade by State and private planting is 55,000 hectares.



Waipa State Sawmill.



Timber yard at the Waipa State Sawmill.

## **PRIVATE EXOTIC FOREST DEVELOPMENT**

The emphasis in the report to this point has been on State exotic forest establishment and production. However, private interests have also been highly active in this field and some account of their participation is necessary.

Private sawmilling has been an essential industry in New Zealand from the earliest days of European contact. Several species of native trees were felled for ship's spars during the 18th century and, with the beginning of deliberate settlement in 1840, the industry grew to be a large and important one, on which construction in the country depended.

This was, however, almost entirely an extractive industry exploiting the native forest, until the reduction of the more readily accessible stands, and the example of a managed approach to forestry as demonstrated by the State, directed the activities of private interests into exotic forestry.

Since the 1920s private companies have played a major role in exotic forestry through their control of large forest areas integrated with utilisation and marketing of forest produce.

Currently, private companies are responsible for a substantial proportion of new forest plantings and it is apparent from this, and policies which the companies have advocated, that they will continue to make a significant contribution to forestry development in New Zealand.

One factor that makes private development of particular value is that, through the independence and diversity of the companies, a broad spectrum of policy alternatives can be evaluated, tested, and those which are most successful put into effect.

## **TIMBER TREATMENT AND PRODUCTS**

As the planting boom progressed it was realised that if the exotic timbers were to come into general use as replacements for the rapidly diminishing indigenous timbers, different and new techniques of processing and holding would have to be developed in order to overcome their deficiencies as structural timbers.

Two main groups of problems were presented by the exotic timbers. To begin with, unlike native timbers, the exotic products were not durable, so methods of preservation had to be investigated. Secondly,



Timber being stacked after eight weeks' diffusion period.

because of poor maintenance and often bad siting in the haste of planting in the boom years, the wood had many defects which reduced its structural quality, made it difficult to work, and detracted from its appearance.

The timber industry was not, as a result, initially enthusiastic about sawing radiata and other exotic trees and customers were reluctant to purchase it.

Therefore, it fell to the Forest Service to demonstrate that radiata was an acceptable substitute for the native timbers. In the late 1930s, the Forest Service embarked on a programme of improvement to achieve this. The first step in the programme was the building of the Waipa State Mill mentioned earlier.

From the outset of the enterprise, three specific consumer objectives were defined — the production of precision-sawn timber, the delivery of clean stock free from stain and mould, and the effective merchandising of the timber.

Over the next 10 years the Forest Service became the largest processor of exotic timbers. At the same time that the Forest Service was investigating methods of sawing and grading timber, the physical and mechanical properties of the wood were being tested and seasoning practices were being improved.

The greatest successes occurred in preservation processes which are essential if a non-durable timber is to be widely used for general purposes.

Timber decays after being damaged by boring insects and attacked by fungi. This problem can be overcome by impregnating the timber with preservatives. The result is often a timber which lasts longer than the durable indigenous timber.

At the age at which exotic timber is cut in New Zealand, generally between 20-45 years, the tree is largely made up of sapwood which is very amenable to treatment with all common timber preservatives. The ease and success of treatment has resulted in over 40 per cent of the timber used in New Zealand being treated with preservatives.

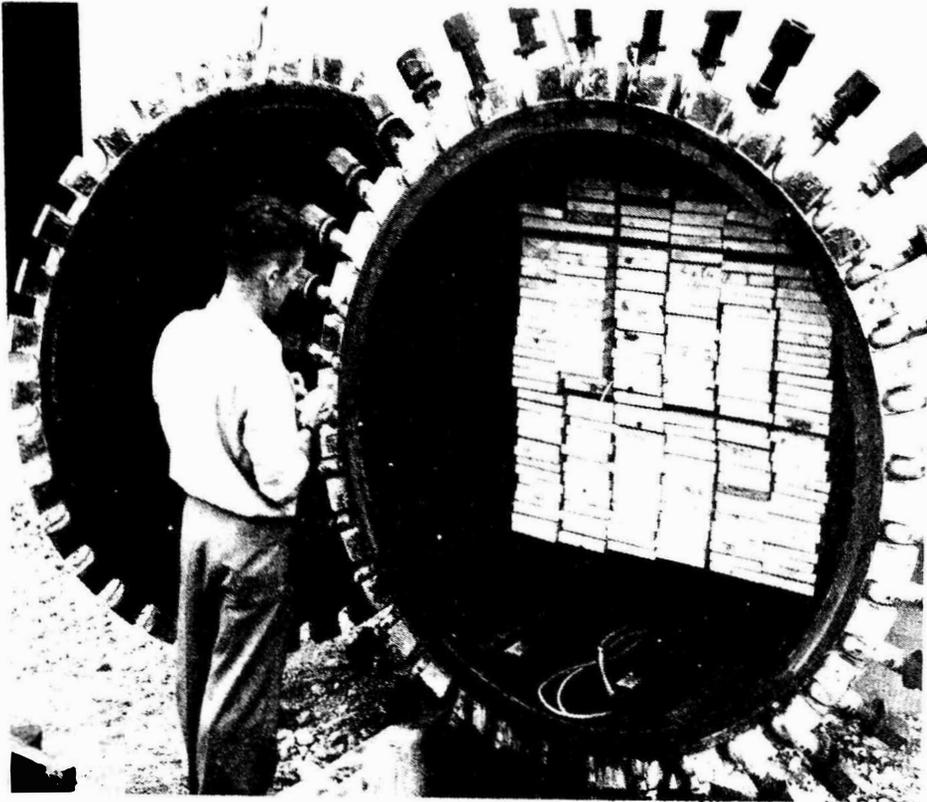
Depending on the use to which the timber will be put, it is treated with different chemicals by different methods. When timber is to be used in situations where there is a decay hazard, pressure treatment is required. In this process the timber is placed in a chamber under high pressure so that the preservatives are forced into the wood. Other methods involve immersion and soaking in the preservatives.

In order to ensure consistent and satisfactory levels of treatment in preserved timber, the Timber Preservation Authority was established under the Timber Preservation Regulations in 1955. These regulations require that the timber must be treated:

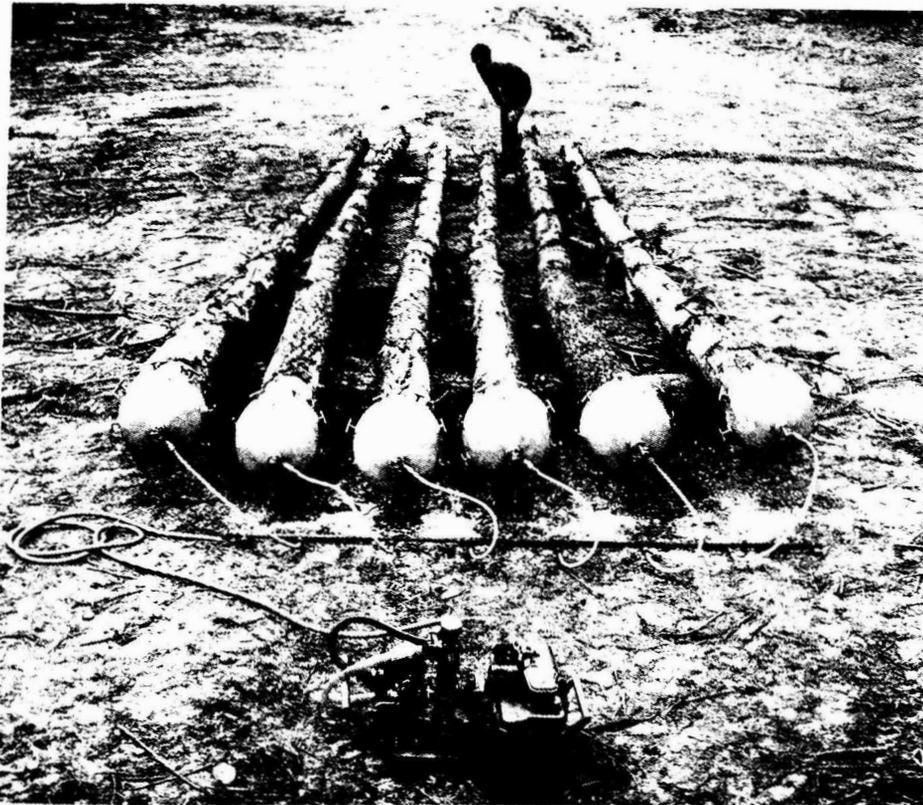
- (1) In an approved plant.
- (2) By an approved process under specified conditions of operation.
- (3) With an approved preservative at retentions and penetrations specified for the particular commodity.

The activities of the authority have been central to the increasing acceptance, both by the public and the lending institutions, of treated exotic timber.

Another new and interesting aspect of timber preservation is represented by the recent investigation by New Zealand Government agencies,



Boliden impregnation plant, Waipa Sawmill.



Equipment required for perfusion impregnation (high pressure sap displacement). A method of timber preservation suitable to conditions in Papua New Guinea.

in co-operation with those of the Papua New Guinea Government, of means of preserving timber more suited to conditions in countries such as Papua New Guinea. At present a method using high pressure sap displacement is showing considerable promise.

The problems of defects in the timber reducing its structural strengths, largely resulted from inadequate silvicultural treatment of many of the forests, the chief weakness being a high number of loose knots resulting from inadequate pruning and thinning. Two methods which have been used to improve quality involve cutting out the defective knotty portions and glueing the defect-free sections together. End matching is used for flooring. This simply involves joining the ends of two pieces of timber of similar dimensions. Finger jointing is similar to dovetailing — the ends of short pieces of defect-free timber are shaped into fingers which interlock and are then glued under pressure. Artificial heat is frequently applied to accelerate glue curing. These pieces can then be bonded edge to edge to make up wide panels.

Glue-lamination of timber is an important development. Construction of beams by glue lamination involves bonding lengths of wood of the same thickness, but of different lengths, into the form of a large beam, which has very low weight-to-strength ratio and can be used in structures of almost any size, cross section or shape. They are particularly useful where large unsupported spans are involved and have the advantage of very high fire resistance when used in large sections.

Particle-board is a timber product being increasingly used in New Zealand, particularly in residential construction mainly in flooring and prefabricated wall modules. This board is not only a valuable building material but its manufacture makes use of slab timber and forest thinnings. These are reduced to chips, dried, bonded with adhesives and formed into sheets of varying thickness, size and density.



Houses almost entirely of radiata pine, including the sub-flooring, which is of treated timber.

## HOUSE PREFABRICATION

Prefabrication in the New Zealand housing industry ranges from pre-cutting of timber to off-site construction of complete houses. Pre-cutting is a valuable time-saving aid to building firms operating in traditional timber-frame house construction. Further assistance can be given by the use of pre-nailed frames and trusses, often using tooth-plate nail connectors.

While pre-cutting and pre-nailing contribute much to conventional building, a variety of building systems take house construction further towards total prefabrication.

In one of these systems, wall modules of solid timber provide great structural strength to the building. Outsides of walls under this system are sheathed in aluminium with a vinyl-enamel coating giving a durable finish. A vertical module system being increasingly used comprises interlocking factory-made wall units.

A considerable number of housing firms in New Zealand are able to deliver completely constructed houses to a site for connection to power and underground services. Smaller houses can be carried as one load, but larger houses need to be supplied in sections small enough to satisfy maximum load restrictions for conveyance by road.

## **Some other factors in growth of settlements in New Zealand**

The preceding paragraphs have given a brief account of the development of a resource which was initially valuable as a central element in a building programme necessitated by a critical housing situation, and has since been further developed to meet a sustained and increasing internal demand and to contribute to external trade.

Naturally, other factors have been significant in influencing the pattern of human settlements in New Zealand.

### **LAND TENURE**

New Zealand was fortunate in its development in that it entered into its period of deliberate colonisation relatively late in time and so benefited from the administrative experience gained in earlier settlements and the advanced technologies and systems of the mid 19th century.

These factors provided the colonising administration with an early appreciation of the advantages of the establishment of a secure land tenure system and the capability to introduce such a system based on accurate land definition surveys.

Upon proclamation of the colony in 1840, the English laws relating to property and conveyancing came into force in New Zealand. In 1841 an Act "to provide for the registration of deeds and instruments affecting real property" was passed, so that from this initial period land transactions were recorded within a single official system.

The Torrens system of land registration was adopted by legislation in South Australia in 1858 and by other Australian States later. Its obvious success commended it for adoption in New Zealand and this was effected by the Land Transfer Act of 1870.

This Act had the effect of guaranteeing title to land as to ownership but not at that time generally, as to parcels. Guarantee of both title and parcels was provided by an amendment in 1888 for land brought under the Act.

The State's guarantee of title to land, based on accurate survey definition, has throughout the period of New Zealand's development been important in that it has provided absolute location of property and public facilities, and provided a sound mapping system and security for loans. Its contribution to the orderly development of the country, ease in effecting land transactions, and implementation of Government policies relating to land has been basic to the planning and growth of settlements throughout New Zealand.



Recently completed medium-density State housing development.

## **FINANCE FOR HOUSING**

New Zealand Governments have, since the turn of the century, accepted the responsibility to ensure an adequate supply of mortgage finance for residential building. They have encouraged private agencies to make finance available for residential purchase or construction and have assisted low and middle income families directly with long term, low interest loans for housing.

Administration of this lending policy was until recently a responsibility of the State Advances Corporation which administered lending for the purchase, extension and improvement of farms and for housing in urban areas, together with other aspects of Government lending related to urban renewal and the granting of assistance to desirable industries. In October 1974, the State Advances Corporation and the Housing Division of the Ministry of Works and Development were merged to form the Housing Corporation of New Zealand.

For the year ending March 1975, 34,000 new dwellings were completed and of these 12,500 were financed directly or partly through the

Housing Corporation and other Government agencies. In the current year the Government has been involved in the financing of approximately half of the 32,000 dwellings which it is estimated will be completed by the end of March 1976.

In addition to direct financial assistance the Housing Corporation administers a Mortgage Guarantee system and during the year ended March 1975 a further 6,000 loans for housing, made by private interests, were guaranteed.

Since 1938, and as a result of the Social Security Act passed that year, a family benefit, which at present is set at (NZ)\$3.00 a week, has been payable in respect of each child under the age of sixteen, or through the child's eighteenth year if the child remains a full-time student. This benefit is normally paid to the mother of the child, and is paid irrespective of the family's means.

In terms of legislation passed in April 1958 it became possible for parents to capitalise the family benefit for housing and this has been of assistance in providing finance for housing, making additions to existing dwellings, and in some cases it has been used to reduce or pay off mortgages.

## **STATE-PROVIDED LOW RENTAL ACCOMMODATION**

The New Zealand Government's responsibility to ensure an adequate supply of accommodation for all New Zealanders has involved the Government in the provision of low-cost rental accommodation for low-income families.

This policy in its most effective form dates back to the 1930s. Although some provision of rental accommodation by Government had been made earlier, the Government, acting on the results of a national housing survey of 1936, launched a vigorous rental construction programme, which with some fluctuation in intensity has remained an important Government activity ever since.

Since 1937 the Government has constructed approximately 80,000 dwellings for rental accommodation. This represents 9 per cent of the total current housing stock. Of these, almost one-third have been purchased by tenants, the remainder being still available for rental.

In response to criticism that large areas of low-cost rental housing have created problems of social development, the Housing Corporation has experimented with policies to overcome this. These policies have included the dispersal of State-owned units among private-owned dwell-

lings, the provision of a wider variety and range of dwellings, ensuring the selection of tenants with a wide variety of socio-economic and cultural backgrounds, and the provision of community-related facilities in predominantly State-owned housing estates.

## **PLANNING IN NEW ZEALAND**

Legislation has existed from an early period to exert an increasing degree of control over aspects of urban development. Since 1953 the pattern of human settlements has come effectively under the influence of a comprehensive town and country planning system. This was achieved in spite of the scarcity of resources and professional skills in the country.

Under the Town and Country Planning Act of 1953, every territorial local authority (County, Borough, City, Town or District Council) is required to prepare a district scheme. The scheme is a legal document drawn up with the general purpose of providing for the development of the authority's area. Before a district scheme is adopted it is advertised so that it can be inspected by the public to permit objection by affected individuals and organisations. The decisions of the planning authority in respect of such objections can be contested before an independent Town and Country Planning Appeal Board whose decision is final. Third party rights, to allow maximum public participation in planning, have been progressively widened since 1953 and this trend is to be continued.

When preparing its scheme the authority must consider, in consultation with the public, the existing land use pattern and modify it to make allowance for future demands such as the provision of new areas for housing. Land is divided into classes of use by zoning, according to the use that is most desirable in terms of "the health, safety, and convenience and the economic and general welfare of its inhabitants and the amenities of every part of the area."

It was intended that the planning system should provide a means for the consideration of the long-term development of the country, so that resources could be allocated to meet future needs. Unfortunately, the local government system involves a large number of small fragmented authorities, often with limited financial resources. It is, therefore, sometimes difficult to achieve concerted action between authorities and this detrimentally affects planning.

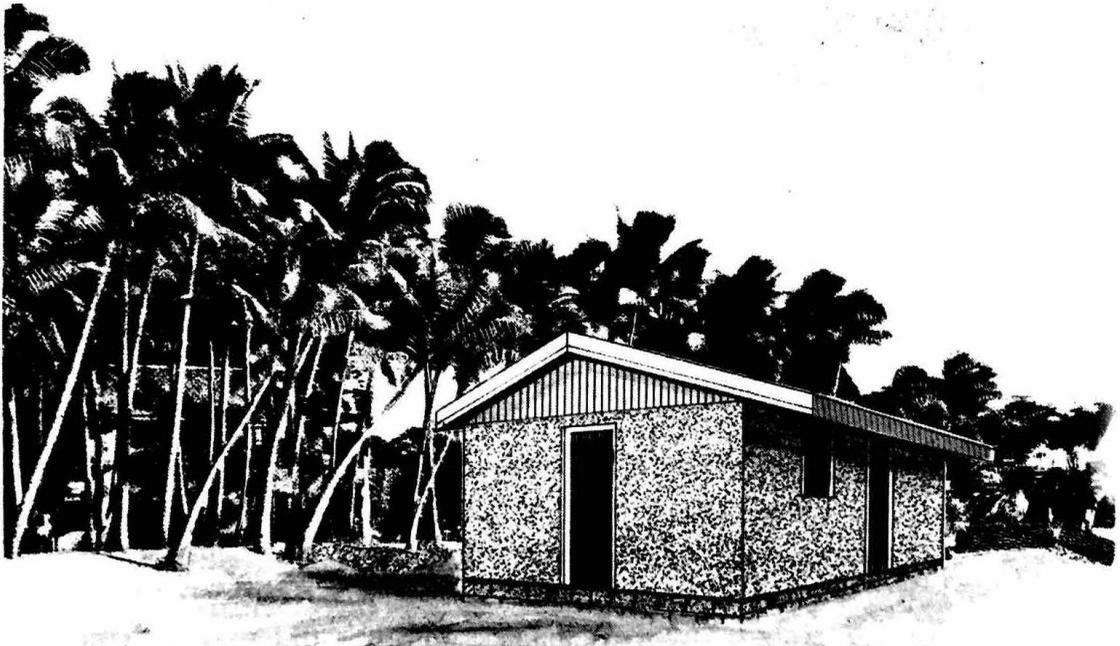
An attempt is now being made to strengthen the planning and local government systems so that greater co-ordination between local authorities and central government may be achieved at the regional level.

## NEW ZEALAND AND HABITAT

The pattern and character of human settlement in New Zealand has been determined by such factors as social aspirations, legislation, and available resources. Although the specific aspects of these factors are unique to New Zealand, this does not mean that the experience and expertise that New Zealand has built up over the years cannot be put to use in other countries and in other conditions.

New Zealand would expect to be able to make a significant contribution to the solution of problems of human settlement beyond its boundaries and particularly in the South Pacific region. New Zealand experience has already been employed in the designing of a low-cost tropical housing unit to meet urgent shelter needs in disaster-hit areas. In 1975, New Zealand sent 450 of these units to Fiji.

New Zealand regards *Habitat*, therefore, as an opportunity for assembling and disseminating information, pooling ideas, drawing upon experiences and working out solutions. New Zealand is confident that it has a contribution to make.



Artist's impression of tropical housing unit.

