

## **Development of the Australian Urban System in Relation to Natural Resource Base, 1851-1991**

Toru TANIUCHI\*

- I Introduction
- II Definitions
- III Metropolitan Concentration and Non-Metropolitan Growth
- IV Mineral Resource Towns
- V Conclusion

### **I Introduction**

#### **1 Urban System and Natural Resources**

This paper discusses the long-term development of the Australian urban system in terms of urban population growth in relation to the natural resources, with special reference to the non-metropolitan urban centres, as one of the preliminary steps to bridge urban system studies and natural resource studies. Australia is one of the most relevant study areas because natural resources have played important roles in the national economy and long-term statistical data of urban population as well as utilization of natural resources are relatively easily available.

Urban system studies have generally neglected physical environment and natural resources. It may make sense for urban geographers to confine their studies within demographic, social and economic research frameworks by neglecting the viewpoints of physical environment and natural resources, so that they can analyze and discuss the matter more clearly. Actual data collected from their study areas, however, often reflect various influences of disturbing factors related to physical environment and natural resources which are not considered within the research

---

\* Department of Human Geography, The University of Tokyo

framework, resulting in a certain contradiction between the analytical framework and the actual data: the actual data should be processed to be consistent with the analytical framework by separating the influences of external factors.

## 2 Natural Resource Base

The term *natural resources* has various definitions. 'Human beings evaluate the natural environment and classify as resources those substances, organisms or physical properties which they are technically capable of utilising and which provide desired goods and services' (Rees 1989: 365). Although natural resources in a broader sense may include natural/potential (not utilized) resources as well as realized (actually utilized) resources, only the realized natural resources are discussed in this paper from realistic and operational considerations. The term *realized* is after Obara (1965), and shares similar viewpoints with *natural resource products* by Ishimitsu (1973).

The analytical framework of natural resource base in this paper basically owes to Perloff and Wingo (1961), which studied relations between the long-term regional development and natural resource endowment in the United States, with special reference to the role of agricultural, mineral and amenity resources in the development of peripheral regions. This paper uses a term *natural resource base* in stead of the above natural resource endowment, leaving the latter to include less or not realized resources. The term *base* also contains the sense in common with economic base in urban/regional economic studies. The natural resource base in this paper include mineral resources (realized as mining), land and water resources (mainly realized as agriculture), and amenity resources (realized as resort development).

## II Definitions

### 1 Study Period

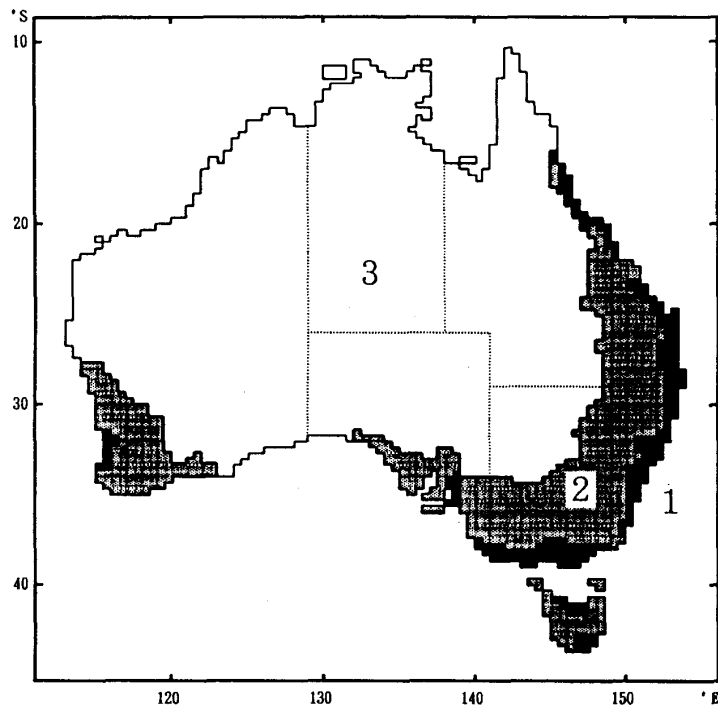
Study period is from 1851 to 1991, and is divided into four periods: 1851-

1891, 1891-1947, 1947-1971, and 1971-1991. The 1890s (the period of severe droughts and serious recession just before the federation) and the 1940s (the period of World War II) are widely accepted as important turning-points in the studies in economic history and historical geography of Australia, and this paper added another turning-point to appreciate the new situation in the Australian economy and urban system after the 1970s. These four periods also correspond the changing importance of natural resource base and industrial sectors to the Australian economy: the leading sectors were mineral resources (mainly gold) and agricultural resources in the first period (1851-1891); agricultural resources with declining mineral resources in the second period (1891-1947); relative decline in agricultural resources with industrialization in the third period (1947-1971); and the shift from manufacturing to services in the fourth period (1971-1991).

## 2 Three Zones

Australia is geographically divided into three zones (Figure 1) mainly based on the distribution and density of population (Figure 2)<sup>1)</sup>, and the regional differences in intensity of agricultural land use related to the uneven distribution of land and water resources and also partly based on the relative location in the Australian urban system (Taniuchi 1987, 1995 and 1996).

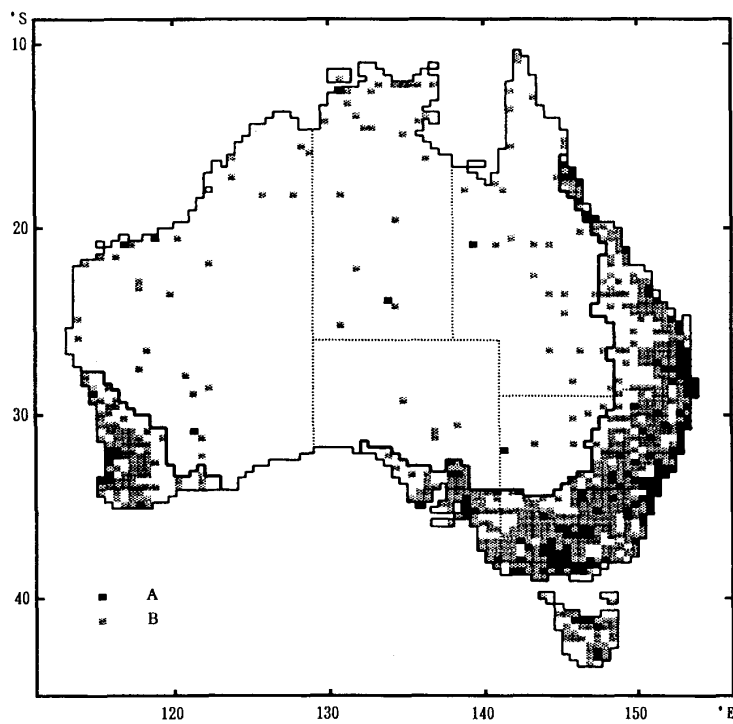
The Zone 1 enjoys accessibility to the state capitals and the major urban centres as well as the intensive agricultural land use including dairy and horticultural farming. This zone accommodates 82% of the national population in 1991 and 31% of the total gross value of agricultural production in 1991/92. The Zone 2 is represented by the mixed farming of crops and livestock as well as the intensive grazing, sharing 16% of the population and 64% of the agricultural production. The border between the Zones 2 and 3 is almost identical to the frontier of cropping. The Zone 3 is characterized by low population density and the extensive grazing, and shares only less than 3% of the population and 5% of the agricultural production (Taniuchi 1995).



**Figure 1. Three Zones.**

1: Zone 1; 2: Zone 2; 3: Zone 3.

Source: Taniuchi (1996: 129).



**Figure 2. Distribution of Population, 1991.**

A: 10,000 (6 per sq. km) and over; B: 500 (0.3 per sq. km) and over.

Source: Taniuchi (1996: 129).

In contrast to the small shares of population and agricultural production, the Zone 3 produces 52% of the total value of mineral production in 1990/91: 97% of iron ore, 88% of gold, 75% of non-ferrous metallic minerals, and 51% of oil and natural gas. While the Zones 1 and 2, which produce 99% of coal and 49% of oil and natural gas, can enjoy accessibility to the metropolitan areas, the Zone 3, which produces most of the metallic minerals, has to send most of the mineral products to the Zones 1 and 2 for further processing such as smelting and refining, because of the unfavourable locational conditions in the Zone 3 (Taniuchi 1995).

### 3 Definitions of Urban Centres

#### a Metropolitan Areas, Major Urban Areas, and Non-Metropolitan Urban Centres

Urban centres are classified into three categories by population size: metropolitan areas, major urban areas, and non-metropolitan urban centres. Definitions below are maintained at least within each period as much as technically possible<sup>2)</sup>.

The metropolitan areas (i.e. state capitals) and the major urban areas are defined as relevant statistical divisions or statistical subdivisions in the census reports<sup>3)</sup>, which have fixed borders such as those of local government areas or equivalent, and include suburban areas and satellite towns.

The non-metropolitan urban centres are operationally defined as urban centres of 1,000 or more population following the definition in the census reports, which has been widely used since the mid-1960s<sup>4)</sup>. Among the non-metropolitan urban centres, those of 10,000 or more population are referred as larger urban centres, leaving the others as smaller urban centres.

Many studies on the Australian urban system have focussed on the metropolitan areas, reflecting the high percentages of the national or state population in the state capitals. The non-metropolitan urban centres, however, should be given more attention as an important element of the urban system: an analysis of the non-metropolitan urban centres is indispensable to discuss counterurbanization which has drawn attention concerning the relative decline in population growth rates of the metropolitan areas in the 1970s.

## b Classification of Non-Metropolitan Urban Centres

*Mineral resource towns* are separated through the whole study period and *resort towns* are separated in the third and fourth periods, leaving the other urban centres as *general towns*. This classification is operationally maintained at least within each period, technically neglecting any changes such as closures of mines during the period.

The mineral resource towns are those which heavily depend on not only mines but also mineral export, smelting, refining, and power generation burning black coal or brown coal<sup>5)</sup>.

The resort towns are characterized by holiday functions, many resident pensioners, and relatively poor central place functions<sup>6)</sup>. They are mainly located in the coastal areas in the Zone 1 (a few of them are found in the highland areas in the Zone 2), and based on amenity resources such as climate and physical landscape. It is necessary to separate these resort towns because their rapid population growth is a substantial disturbing factor to discuss the non-metropolitan centres within the general framework of urban system, as discussed later.

Most of the general towns are traditional country towns serving the surrounding agricultural areas through central place functions as well as processing of agricultural products. They can be interpreted to be based on land and water resources<sup>7)</sup>.

### III Metropolitan Concentration and Non-Metropolitan Growth

Metropolitan concentration is the most important feature of the Australian urban system. Many reasons have been argued: 'The state capital was the first place of settlement in each state'; 'the state capitals were major gateways as main ports for trade and migration' (Taniuchi 1985). Many of these reasonings, however, have failed to explain the metropolitan concentration: they cannot explain the differences from North America, where many major inland urban centres have developed without any background as the first place of settlement or gateway. In view of the differences

between Australia and North America, the poor natural resource base in the substantial part of Australia seems to make sense. The metropolitan concentration in Australia should be discussed from the viewpoint of the whole urban system, asking why growth of the non-metropolitan urban centres have been limited.

### 1 The First Period (1851-1891)

It is generally accepted in many countries that major source of metropolitan concentration was internal rural-urban migration, i.e. relative changes in distribution of population within the closed system. In Australia, however, major component of the metropolitan growth was international migration (Taniuchi 1985).

Population growth rates of the metropolitan areas were generally higher than those of the non-metropolitan urban centres and the non-urban areas until 1971 (Table 1). In the first period (1851-1891) with higher rates of economic growth and net migration, the metropolitan growth was the result of overseas migration because population growth rates of the non-urban areas were much higher than the rates of natural increase<sup>8)</sup>.

It is worth noting that the non-urban areas are not necessarily rural areas. By definition, the non-metropolitan urban centres in Table 1 are only those of 1,000 or more population at the beginning of each period. When a small settlement of less than 1,000 population grew rapidly to over 1,000, this settlement is included in the non-urban areas in this period, and is included in the non-metropolitan urban centres in the next period. Population growth of the non-urban areas, particularly in 1851-1891, includes not only rural growth but also growth of urban nature. This is confirmed by Table 2: the percentage share of national population in the non-urban areas declined in 1851-1891, while the share in the non-metropolitan urban centres increased in spite of the lower growth rates in Table 1. The non-urban areas in this period apparently played a role of seed-bed for new urban growth.

Table 1. Average Annual Rates of Population Growth (%)

	By size											
	National population			Metro-politan areas (a)		Major urban areas (b)		Non-metro-politan urban centres		Non-metropolitan urban centres by functional type		
	Total	Natural increase	Net migration	A		B		Non-urban areas	Non-urban centres	General towns	Mineral resource towns	Resort towns
1851-1861	10.82	n.a.	n.a.	7.48	7.19	..	4.32	14.08	5.36	0.47	..	
1861-1871	3.74	2.49	1.24	3.55	1.08	..	3.97	4.04	2.59	4.54	..	
1871-1881	3.07	2.07	1.01	3.67	1.97	..	1.29	3.30	3.48	-0.21	..	
1881-1891	3.51	2.05	1.46	5.28	3.99	..	1.27	2.83	2.72	-0.23	..	
1891-1901	1.73	1.66	0.07	1.72	1.46	..	1.64	1.81	1.44	1.93	..	
1901-1911	1.67	1.57	0.10	2.17	2.37	..	0.43	1.68	1.24	-0.71	..	
1911-1921	2.01	1.58	0.43	3.49	3.12	4.34	0.48	0.58	1.05	-0.67	..	
1921-1933	1.63	1.22	0.41	2.05	1.75	8.79	1.13	1.14	1.58	-0.30	..	
1933-1947	0.96	0.94	0.02	1.56	1.50	5.38	0.97	-0.55	1.12	0.40	..	
1947-1954	2.46	1.38	1.08	2.51	3.37	6.25	2.57	1.86	2.51	2.92	2.99	
1954-1961	2.26	1.40	0.86	2.86	2.98	7.72	1.80	0.14	1.83	1.41	2.05	
1961-1966	1.92	1.23	0.69	2.35	2.07	8.52	1.55	-0.02	1.49	1.58	2.94	
1966-1971	1.92	1.11	0.82	2.35	1.75	7.44	1.81	-0.59	1.46	2.95	5.67	
1971-1976	1.44	1.02	0.42	1.41	1.44	6.37	1.48	0.62	1.29	0.80	5.65	
1976-1981	1.24	0.82	0.51	1.00	0.95	4.00	1.51	1.62	1.15	0.99	5.95	
1981-1986	1.43	0.83	0.55	1.30	0.45	3.72	1.37	2.05	1.16	0.10	4.28	
1986-1991	1.53	0.76	0.77	1.43	1.15	3.62	1.42	1.87	0.94	-0.22	5.54	

(a) Sydney, Melbourne, Brisbane, Adelaide, Perth and Hobart (state capitals).

(b) A: Newcastle, Wollongong and Geelong; B: Canberra (since 1911) and Gold Coast (since 1947).  
See text for general definitions and sources.



2 The Second and Third Periods (1891-1971)

The second period (1891-1947) was the period of lower rates of economic growth and net migration. The metropolitan areas, however, generally grew more rapidly than the non-metropolitan urban centres and the non-urban areas which failed even to catch up with natural increase. This could be interpreted as a result of internal migration within the closed system formed by the disappearance of frontier.

In the third period (1947-1971) with higher rates of economic growth and net migration, the non-urban areas no more played the seed-bed role and showed absolute decrease of population, in contrast with the metropolitan areas and the non-

**Table 2. Shares of National Population (%)**

	By size					By type (Non-metropolitan urban)		
	Metro- politan	Major urban		Non- metro- politan urban	Non- urban	General towns	Mineral resource towns	Resort towns
		(A)	(B)					
1851	43.4	7.2	..	4.0	45.4	2.9	1.0	..
1861	31.9	5.1	..	12.2	50.8	3.8	8.4	..
1871	31.3	4.0	..	15.9	48.8	5.9	10.0	..
1881	33.2	3.6	..	16.9	46.4	8.0	8.8	..
1891	39.3	3.7	..	17.4	39.5	9.5	7.9	..
1891	39.6	3.7	..	17.1	39.6	10.1	7.0	..
1901	39.6	3.6	..	19.4	37.3	11.0	8.5	..
1911	41.6	3.9	..	21.1	33.4	13.8	7.3	..
1911	43.2	3.9	..	21.1	31.8	13.8	7.3	..
1921	49.9	4.3	..	17.5	28.2	13.0	4.5	..
1933	52.4	4.4	0.1	17.0	26.1	13.4	3.7	..
1947	56.9	4.7	0.2	17.4	20.7	13.9	3.5	..
1947	57.9	4.7	0.6	17.5	19.3	15.1	1.9	0.5
1954	58.1	5.0	0.7	18.4	17.7	15.7	2.0	0.6
1961	60.5	5.3	1.1	17.8	15.3	15.3	1.9	0.6
1961	60.4	5.3	1.1	17.8	15.4	15.3	1.9	0.7
1966	61.7	5.3	1.5	17.6	13.9	15.0	1.9	0.7
1971	63.0	5.3	1.9	17.8	12.0	14.7	2.2	0.9
1971	63.0	5.3	1.9	17.8	12.0	14.6	2.2	1.0
1976	62.9	5.3	2.4	18.1	11.3	14.6	2.2	1.3
1981	62.2	5.2	2.8	18.6	11.3	14.5	2.2	1.9
1986	61.8	5.0	3.1	18.9	11.2	14.5	2.1	2.3
1991	61.5	4.9	3.4	19.2	11.1	14.2	2.0	2.9

metropolitan urban centres which grew more rapidly than natural increase, supported by international and internal inflows of migrants.

### 3 The Fourth Period (1971-1991)

The fourth period saw declining population growth rates of the metropolitan areas and higher growth rates of the non-metropolitan urban centres and the non-urban areas, reflecting the lower rates of economic growth and net migration. The substantial metropolitan concentration as occurred in the past periods is no more identified, although it remains to be examined whether this new trend should be regarded as counterurbanization.

The category with the highest growth rates in Table 1 is the major urban areas (B), followed by the non-urban areas. The major urban areas (B), i.e. Canberra (federal capital) and Gold Coast (resort centre), are growing rapidly and also show increasing shares of the national population (Table 2). The non-urban areas, however, show relatively declining shares (Table 2) in spite of the higher growth rates (Table 1), while the non-metropolitan urban centres show increasing national shares in contrast to the lower growth rates, suggesting a certain seed-bed role of the non-urban areas similar to the first period. As far as the changing shares in Table 2 concerned, an apparent shift from the metropolitan areas to the major urban areas (B) and the non-metropolitan urban centres is preliminarily identified.

Tables 1 and 2 also show growth rates of and changing shares in the non-metropolitan urban centres by functional type. These figures reveal that the resort towns grew rapidly with increasing shares in contrast to the stable or declining trends in the other two types, suggesting that the apparent trend of counterurbanization in terms of the declining share in the metropolitan areas has something to do with the growth of the resort towns. If counterurbanization means a certain shift from the higher-level (metropolitan) centres to the lower-level centres in an urban system, the general towns with central place functions should be expected to grow, but this was not the case. The apparent shift to the resort towns should not be interpreted as

counterurbanization but should be interpreted as a certain kind of expansion of the metropolitan areas, if not spatially continuous, which is rather functionally comparable to intra-metropolitan decentralization to suburban areas or satellite towns.

#### **IV Mineral Resource Towns**

##### **1 Number of Centres and Share of the National Population**

Table 3 shows changing number of the non-metropolitan urban centres by type, zone and size. It is generally expected that number of the urban centres would increase following the growth of national population, and also number of the larger urban centres would increase as a result of the growth of the smaller urban centres. These are almost confirmed by the general towns in the Zones 1 and 2.

Changes in number of the mineral resource towns are more complicated. In the first period (1851-1891), total number increased through the period, while number of the smaller centres in the Zones 1 and 2 decreased after 1881. In the second period (1891-1947), total number decreased after the peak year of 1911, especially in the Zone 3, reflecting the declining importance of mining in the national economy. And in the third and fourth periods (1947-1991), total number has increased again including the increase of smaller centres in 1966-1971.

The increasing number of mineral resource towns, however, did not contribute to the shares of the national population (Table 4). The share declined from 1871 to 1891 in spite of the increasing number, in contrast to the general towns which showed steady increase in the shares. The share in the mineral resource towns was stable or declined after 1947 in spite of the increasing number, except in 1966-1971 in the Zone 3. These cases imply that the new development of centres was cancelled out by the decline of existing centres.

##### **2 Population Growth Rates**

Table 5 summarizes changing population growth rates of the non-metropolitan

Table 3. Number of Non-Metropolitan Urban Centres

	General towns						Mineral resource towns						Resort towns					
	Zone 1		Zone 2		Zone 3		Zone 1		Zone 2		Zone 3		Zone 1		Zone 2		Total	
	L	S	L	S	L	S	L	S	L	S	L	S	L	S	L	S	L	S
1851	..	2	..	2	..	..	4	..	..	..	..	1	..	..	..	..	..	..
1861	1	9	..	10	..	..	20	..	2	20	..	23	..	..	..	..	..	..
1871	1	19	..	23	..	..	43	..	3	38	..	44	..	..	..	..	..	..
1881	1	28	..	40	..	2	71	..	6	2	42	5	55	..	..	..	..	..
1891	2	40	1	65	..	7	115	1	3	2	41	2	57	..	..	..	..	..
1891	3	38	2	70	..	7	120	1	2	2	36	2	51	..	..	..	..	..
1901	4	49	2	87	..	8	150	1	3	2	39	3	61	..	..	..	..	..
1911	3	89	2	150	..	9	253	1	8	2	40	3	75	..	..	..	..	..
1921	5	95	3	151	..	11	265	..	7	3	30	2	47	..	..	..	..	..
1933	8	100	6	155	..	11	280	..	6	4	27	2	45	..	..	..	..	..
1947	9	108	7	157	..	11	292	..	7	4	27	2	45	..	..	..	..	..
1947	10	81	12	163	..	13	279	..	5	2	9	2	21	..	18	..	..	18
1954	13	88	14	192	..	17	324	1	5	2	8	2	22	..	24	..	..	24
1961	17	84	17	193	1	18	330	2	4	3	8	3	24	..	26	..	..	26
1966	17	85	20	192	1	20	335	3	3	3	9	3	27	..	28	..	..	28
1971	19	84	20	186	2	21	332	3	3	3	12	3	39	1	34	..	..	35
1971	20	83	21	185	2	21	332	3	4	3	12	3	40	1	34	..	5	40
1976	20	87	21	180	2	22	332	3	5	3	12	4	41	3	45	..	7	55
1981	21	89	22	185	2	23	342	3	5	3	14	4	48	6	62	..	11	79
1986	24	98	26	188	2	29	367	4	4	3	15	4	53	8	77	..	13	98
1991	26	107	25	200	2	30	390	5	6	3	13	5	55	12	92	..	16	120

L: Larger centres; S: Smaller centres.

urban centres by type, size and zone. By definition, only the growth rates of the existing centres at each period are shown and do not reflect the new development of centres.

The general towns show almost steady growth rates after 1891, especially in the larger centres in the Zones 1 and 2 as well as the smaller centres in the Zone 1. The relatively higher growth rates of the smaller centres in the Zone 1 than those in the Zone 2 after 1966 partly reflect a certain effects of resort functions and better accessibility to the metropolitan and larger centres<sup>9)</sup>.

In contrast to the general towns, the mineral resource towns show complicated changes in their growth rates. Many cases of absolute decline or very slow growth are shown before 1947, suggesting general difficulty for a mineral resource

**Table 4. Shares of National Population, Non-Metropolitan Urban Centres (%)**

	General towns				Mineral resource towns				Resort towns	
	Zone 1	Zone 2	Zone 3	Total 1-3	Zone 1	Zone 2	Zone 3	Total 1-3	Total 1-2	Total
1851	2.0	0.9	..	2.9	..	1.0	..	1.0	..	4.0
1861	2.2	1.6	..	3.8	0.2	8.2	..	8.4	..	12.2
1871	3.1	2.8	..	5.9	0.3	9.6	0.1	10.0	..	15.9
1881	3.5	4.4	0.1	8.0	0.6	7.8	0.4	8.8	..	16.9
1891	4.2	5.0	0.4	9.5	0.5	6.0	1.4	7.9	..	17.4
1891	4.3	5.5	0.4	10.1	0.5	5.1	1.4	7.0	..	17.1
1901	4.7	5.9	0.3	11.0	0.6	5.3	2.7	8.5	..	19.4
1911	5.6	7.9	0.3	13.8	0.6	4.4	2.3	7.3	..	21.1
1911	5.6	7.9	0.3	13.8	0.6	4.4	2.3	7.3	..	21.1
1921	5.7	7.0	0.3	13.0	0.3	3.0	1.1	4.5	..	17.5
1933	5.8	7.3	0.3	13.4	0.3	2.4	0.9	3.7	..	17.0
1947	6.4	7.2	0.3	13.9	0.4	2.3	0.9	3.5	..	17.4
1947	5.9	8.7	0.5	15.1	0.3	0.7	0.8	1.9	0.5	17.5
1954	6.1	9.1	0.5	15.7	0.5	0.7	0.7	2.0	0.6	18.4
1961	6.0	8.6	0.6	15.3	0.6	0.7	0.7	1.9	0.6	17.8
1961	6.0	8.6	0.6	15.3	0.6	0.7	0.7	1.9	0.7	17.8
1966	5.9	8.5	0.7	15.0	0.6	0.7	0.7	1.9	0.7	17.6
1971	5.8	8.1	0.8	14.7	0.6	0.7	1.0	2.2	0.9	17.8
1971	5.8	8.0	0.8	14.6	0.6	0.7	0.9	2.2	1.0	17.8
1976	5.9	7.9	0.8	14.6	0.6	0.7	0.9	2.2	1.3	18.1
1981	5.9	7.8	0.9	14.5	0.6	0.7	0.9	2.2	1.9	18.6
1986	5.9	7.6	1.0	14.5	0.6	0.7	0.9	2.1	2.3	18.9
1991	5.8	7.4	1.0	14.2	0.6	0.6	0.9	2.0	2.9	19.2

**Table 5. Average Annual Rates of Population Growth, Non-Metropolitan Urban Centres (%)**

	Larger centres			Smaller Centres			Total
	Zone 1	Zone 2	Zone 3	Zone 1	Zone 2	Zone 3	
<b>General towns</b>							
1851-1861	..	..	..	4.70*	6.75*	..	5.36
1861-1871	0.49*	..	..	1.63	4.25	..	2.59
1871-1881	1.60*	..	..	2.87	4.35	..	3.48
1881-1891	3.05*	..	..	3.16	2.31	4.72*	2.72
1891-1901	2.41*	1.26*	..	1.25	1.54	-2.04	1.44
1901-1911	-0.17	0.59*	..	1.05	1.89	0.20	1.24
1911-1921	3.04	2.46*	..	1.27	0.43	0.69	1.05
1921-1933	1.60	1.52	..	1.48	1.68	0.90	1.58
1933-1947	1.73	1.41	..	1.40	0.67	0.44	1.12
1947-1954	2.42	2.12	..	3.07	2.49	2.31	2.51
1954-1961	2.18	1.92	..	1.91	1.34	3.90	1.83
1961-1966	1.90	1.66	7.22*	0.98	1.19	1.01	1.49
1966-1971	1.75	1.77	11.46*	1.42	0.53	1.33	1.46
1971-1976	1.70	1.83	3.50*	1.14	0.38	0.15	1.29
1976-1981	1.12	1.61	5.01*	1.04	0.49	-0.18	1.15
1981-1986	1.01	1.12	5.61*	1.29	0.54	2.34	1.16
1986-1991	0.99	0.93	0.63*	1.28	0.63	2.11	0.94
<b>Mineral resource towns</b>							
1851-1861	..	..	..	..	0.47*	..	0.47*
1861-1871	..	5.98*	..	1.80*	-0.16	..	4.54
1871-1881	..	0.05*	..	-1.39	-0.35	-2.55*	-0.21
1881-1891	..	0.23*	..	2.38	-2.17	7.65	-0.23
1891-1901	2.44*	1.05*	3.89*	3.49*	1.85	1.15	1.93
1901-1911	-2.06*	-1.00*	-0.06	-2.35	-0.13	-3.19	-0.71
1911-1921	-4.43*	-1.13*	-2.38	-0.02	-1.36	-8.38	-0.67
1921-1933	..	-0.12	-0.37*	0.76	-0.43	-1.93	-0.30
1933-1947	..	0.44	0.89*	1.19	-0.13	-0.35	0.40
1947-1954	..	1.42*	0.46*	8.88	1.31	5.30	2.92
1954-1961	1.73*	0.05*	-0.29*	3.19	1.80	5.42	1.41
1961-1966	1.14*	3.00	0.30	6.29	-1.97	2.89	1.58
1966-1971	0.38	3.54	2.61	3.65	1.35	15.31	2.95
1971-1976	0.07	0.16	-0.96	1.74	3.71	2.92	0.80
1976-1981	1.01	-0.74	0.12	2.73	1.88	3.23	0.99
1981-1986	0.00	-1.82	-0.09	1.91	1.56	0.30	0.10
1986-1991	0.37	-0.70	-0.21	0.34	-1.95	0.71	-0.22
<b>Resort towns</b>							
1947-1954	..	..	..	2.99	..	..	2.99
1954-1961	..	..	..	2.05	..	..	2.05
1961-1966	..	..	..	2.94	..	..	2.94
1966-1971	..	..	..	5.67	..	..	5.67
1971-1976	3.36*	..	..	6.26	-0.31**	..	5.65
1976-1981	7.44	..	..	5.82	2.36	..	5.95
1981-1986	4.15	..	..	4.56	1.99	..	4.28
1986-1991	5.30	..	..	5.66	5.87	..	5.54

\* Less than three centres. \*\* Includes those which were not yet resort towns in this stage.

town to grow steadily. The higher growth rates after 1947 mainly reflect initial growth by large-scale mineral development projects, although the growth rate declined after the early 1970s, especially in the larger centres, implying that mineral resources may contribute to new developments and initial growth as smaller centres but not necessarily to long-term steady growth as larger centres.

### 3 Cases of Growth and Decline

Figure 3 shows two cases of the past gold mining towns and three cases of the existing major mining towns.

Ballarat and Bendigo (A) are the most well-known gold mining towns developed in the gold-rush era in the mid-19th century. After the population decrease caused by the stagnating gold production in the early 20th century, they have successfully grown as the leading regional centres with commercial, industrial and service functions (as general towns in the context of this paper), taking advantages of the infrastructure developed in the gold mining era as well as the surrounding rich agricultural areas in the Zone 2.

Broken Hill (B), Kalgoorlie (C) and Mount Isa (D) are exceptionally large existing mineral resource towns in the Zone 3. Although they have some functions as regional centres, they are heavily dependent on the mineral resources and they cannot expect long-term steady growth without mineral resources mainly because of poor land and water resources in the local areas as well as remote location. Moreover, the recent gold mining boom in Kalgoorlie (C), stimulated by the rising price of gold, has not fully contributed to population growth because of the highly mechanized mining. Mount Isa (D) has also failed to increase or even to maintain its population in spite of the increasing mineral production, again because of the modern capital-intensive mining. It would be difficult to expect substantial population growth of the mineral resource towns even if mineral resources play important roles in the national or regional economy.

Figure 4 summarizes growth and decline of the urban centres which were once

mineral resource towns during the period from 1851 to 1961, by showing the peak population as a mineral resource town in the past and the population in 1991 for each centre. Among the 132 centres, 73 centres have 'disappeared' as urban centres by the definition in this paper, with population of less than 1,000 in 1991. Among the 59

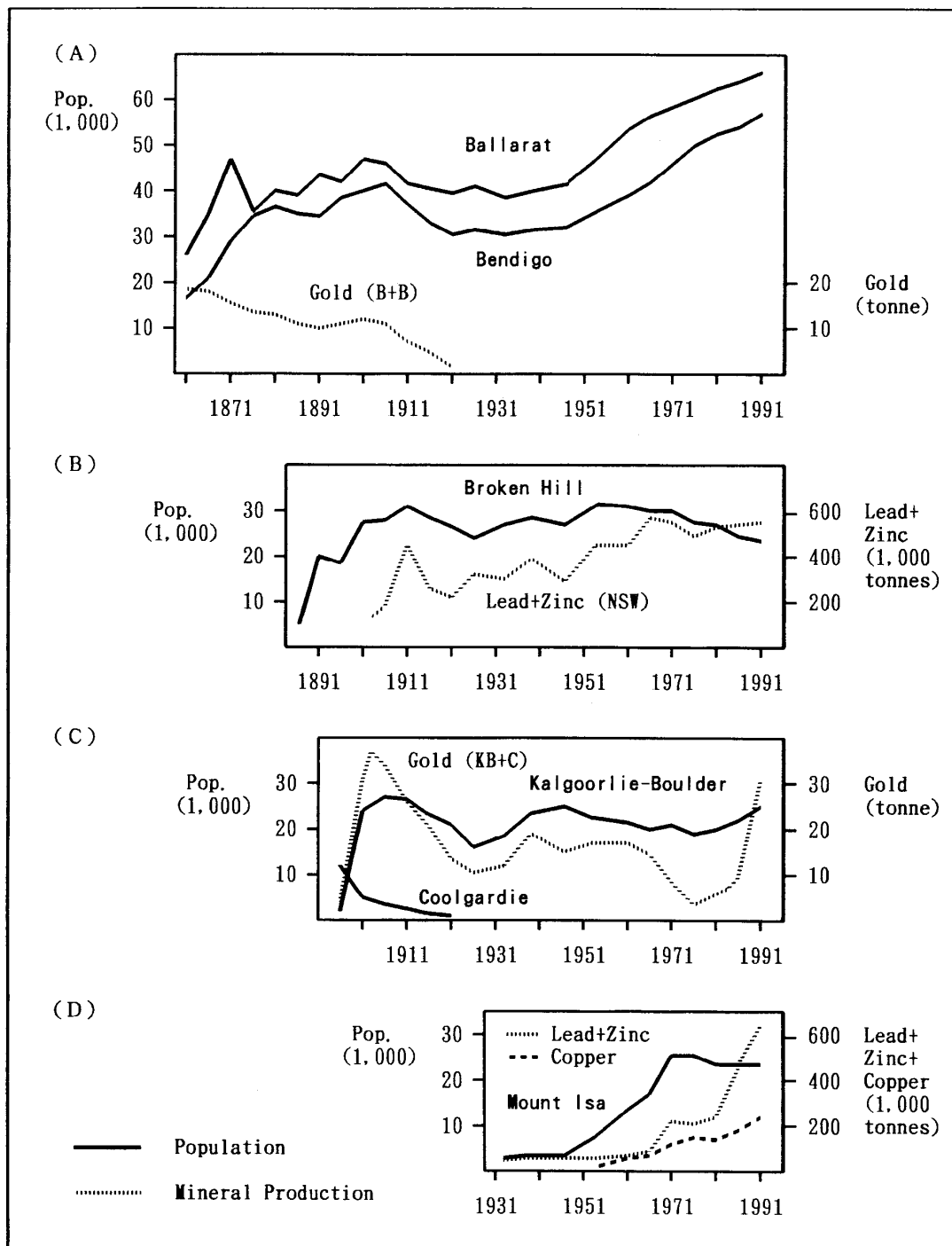
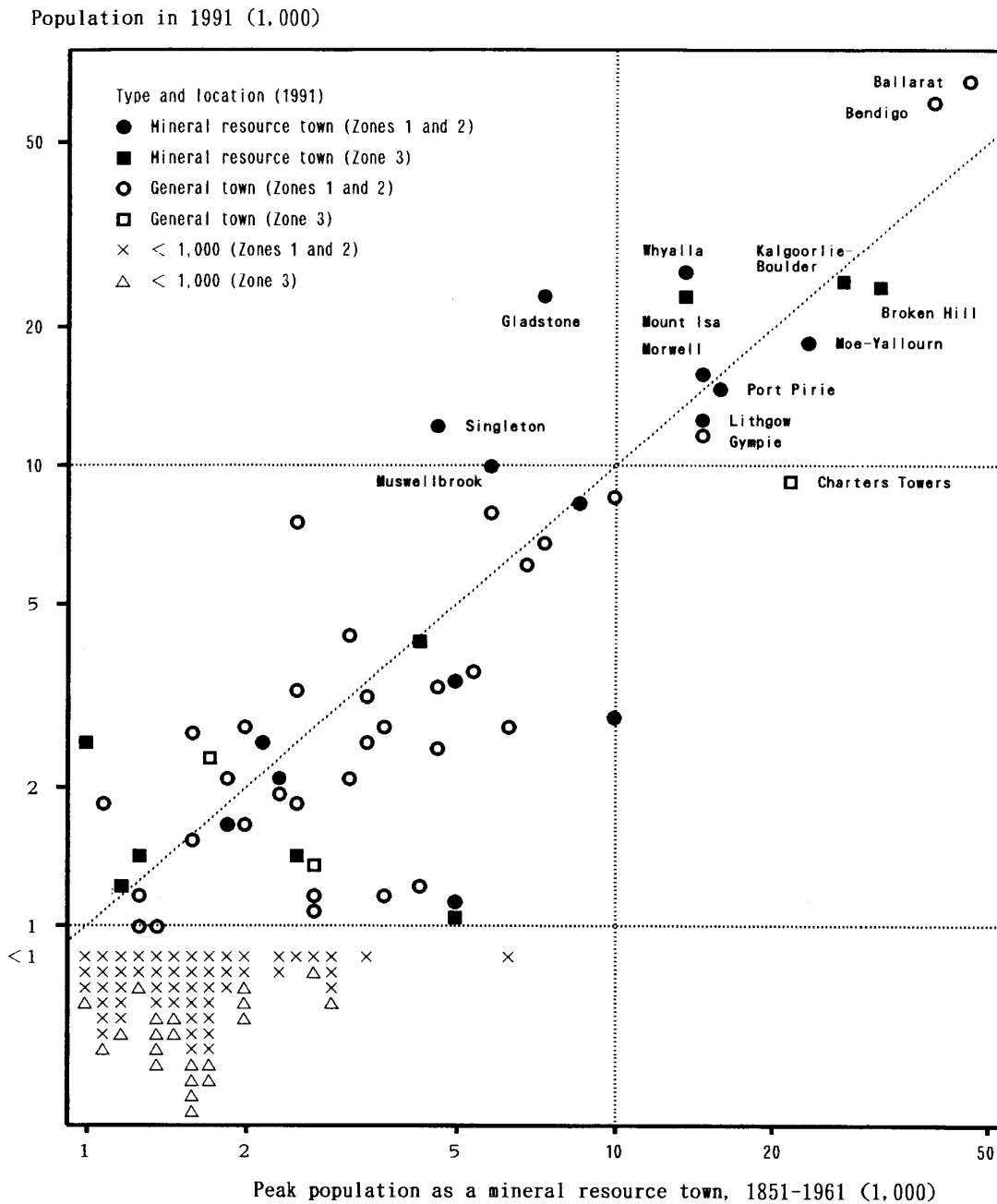


Figure 3. Population and Mineral Production in Selected Mineral Resource Towns.



'survived' centres, only 24 centres are still mineral resource towns and the other 35 centres have survived as general towns. Only 10 mineral resource towns and 11 general towns are plotted above the oblique line. These facts suggest that the selected cases in Figure 3, especially the cases of Ballarat and Bendigo, are excep-



**Figure 4. Growth and Decline of Mineral Resource Towns.**

Actual population less than 1,000 in 1991 is not indicated.

The general towns in the Zones 1 and 2 include one resort town.

tional cases among the many centres with historical background as mineral resource towns, and confirm the findings from the aggregate data in the previous sections.

## **V Conclusion**

This paper has presented a viewpoint of natural resource base as an effective analytical tool to study the Australian urban system. Major findings are as follows.

1) The metropolitan concentration, the most important feature of the Australian urban system, should be discussed with special reference to possibilities and limits of growth of the non-metropolitan urban centres in relation to natural resource base.

2) The argument of counterurbanization in the Australian urban system related to the relative decline in the metropolitan population growth after the 1970s cannot be supported. The apparent growth of the non-metropolitan urban centres is not a result of the growth of the general towns but of the resort towns based on amenity resources which should be separated from the general framework to discuss counterurbanization.

3) The role of mineral resources should not be overestimated as factors of the growth of the non-metropolitan urban centres, even if the mineral resources play important economic roles in the national or regional economy. This is confirmed by the findings that population growth rates of the mineral resource towns were unstable and have not contributed to the shares of national population, and that many of the urban centres which were once mineral resource towns have failed to grow.

4) Land and water resources have contributed to the long-term steady growth of the general towns which play the most important role in the urban system, including the cases of former mineral resource towns which have survived and grown as general towns.

## Notes

- 1) One mesh in Figure 2 covers an area equivalent to four Japanese topographical maps on the scale of 1: 50,000, and actually covers an area around 1,700 sq. km at the latitude near Sydney. Figure 2 also shows the border between the Zones 2 and 3.
- 2) The long-term historical database of urban population has been compiled by the author mainly based on the various issues of census reports published by the Bureaus of Statistics of colonial/state and federal governments. Most of the census reports list up urban centres and settlements of 200 or more population. Certain necessary arrangements have been made to solve the various technical problems mainly concerned with changes in definitions. In some cases, dual set of data were prepared for the same year (e.g. 1961 and 1971) for more strict comparisons with earlier and later years.
- 3) The definitions of statistical divisions and statistical subdivisions as of 1991 were retrospectively applied to earlier years as much as possible, with minor technical modifications. The major urban centres are urban centres of 100,000 or more population, which are comparable to or even larger than the smallest state capital (Hobart). It has been widely accepted to separate these major centres from other non-metropolitan centres. The major urban centres except Canberra are all located near the state capitals. Townsville was not included, although its population exceeded 100,000 in 1991.
- 4) This definition is based on the principle of moving boundary as the DIDs in Japan. Local government areas do not represent the actual urban areas in many smaller urban centres.
- 5) For some larger urban centres for which employment data are available, those with more than 10% of the total employment in the mining sector or more than 5% in the occupation of miners have been selected. For the other smaller centres, those centres where mines, ports of mineral exports, refineries and other relevant facilities are located have been selected, based on the various sources of geographical information.
- 6) It has been empirically identified that many well-known holiday resorts show higher percentage of the total dwellings in unoccupied dwellings (Taniuchi 1987). These data are available in the recent census reports for the urban centres and settlements of 200 or more population. Those centres with unoccupied rates over 10% were preliminarily selected, and then some depopulating remote centres with high unoccupied rates but without any possibility to be resorts were excluded.
- 7) The general towns include a few non-agricultural centres which depend on forestry, dam construction, or military bases, etc. They were not excluded because it was technically impossible to identify these specialized functions dating back to earlier years and also because the number and population size of such centres were too small to affect the aggregates. Although Taniuchi (1993) further classified the general towns of 2,500 and

more population into four sub-groups and discussed the growth of each sub-group from 1961 to 1991, it was technically impossible to apply this classification to the smaller centres as well as to the earlier years.

- 8) Although the data for natural increase and migration are not available for 1851-1861 in Table 1, it can be assumed that the migration rate was extremely high.
- 9) Higher rates of the smaller general towns in 1947-1961 and of the larger general towns after 1961 in the Zone 3 reflect the rapid growth of Darwin and Alice Springs. Their growth was mainly due to the government functions comparable to Canberra, and much less comparable to the many ordinary general towns in the agricultural areas. The higher rates of the smaller general towns in the Zone 3 after 1981 reflect the recent mining developments in a few centres which were technically classified as general towns.

## References

- Ishimitsu, T. 1973. *Resources and mankind*. Tokyo: Nihon Keizai Shimbunsha. (J)
- Obara, K. 1965. *Geography of the modern capitalism*. Tokyo, Taimeido. (J)
- Perloff, H., and Wingo, L., Jr. 1961. Natural resource endowment and regional economic growth. In *Natural resources and economic growth*, ed. J. Spengler, 191-212. Washington, D.C.: Resources for the Future.
- Rees, J. 1989. Natural resources, economy and society. In *Horizons in human geography*, ed. D. Gregory and R. Walford, 364-394. London: Macmillan.
- Taniuchi, T. 1985. The Australian urban system. In *Urban systems in the world: A new regional geography*, ed. T. Yamaguchi, 157-181. Tokyo: Kokon-Shoin. (J)
- Taniuchi, T. 1987. Regional economic structure and natural resource base in Australia. *Jimbun-Ronso* (Mie Univ.) 4: 119-127. (J)
- Taniuchi, T. 1993. Population growth of the non-metropolitan urban centres in Australia, 1961-91. *Hikone-Ronso* (Shiga Univ.) 285/286: 63-72. (J)
- Taniuchi, T. 1995. Regional structure of the Australian economy. In *Economic and industrial geography of the world*, ed. S. Yamamoto, 262-280. Tokyo: Asakura-Shoten. (J)
- Taniuchi, T. 1996. Distribution maps of Australia. In *An introduction to geography*. ed. T. Takahashi, T. Taniuchi, K. Abe and T. Sato, 128-131. Tokyo: Kokon-Shoin. (J)