TREE–CANOPY CHARACTERISTICS AND URBAN DEVELOPMENT IN HONG KONG*

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ABSTRACT. *Tree-canopy coverage and configuration in built-up areas of Hong Kong are the focus of this study. It examines the areal associations of tree-canopy features with landuse and urban-growth history. Tree canopy is classified by geometric criteria of coverage, shape, connectivity, and contiguity. Three main canopy types, each with three variants, are identified: isolated, linear, and connected. The unevenly distributed canopy is predominantly low, scanty, and disconnected. Comprehensive planning is required to modify current patterns.*

MODIFICATION and destruction of vegetation leave large areas covered by seminatural and artificial communities. Because perturbations of this sort are most thorough in cities, survival of natural vegetation there is meager and largely by default. Urbanization effectively severs an increasing proportion of the human population from natural vegetation, although recent environmental awareness emphasizes maintenance and emulation of nature in cities. The literature on this topic by geographers is relatively limited, and the scope for ecological studies in cities, especially of vegetation, remains broad.[1] From a synoptic viewpoint, the effects of urban development are worth examining, because such studies emphasize the close interactions between mankind and nature and offer possibilities for a synthesis of human and physical aspects of geography.[2]

Hong Kong is a subtropical Asiatic city with many sharp contrasts. The physical and cultural conditions for the existence of urban vegetation, to a certain extent, differ from those in western cities that have been the focus of the bulk of case studies on urban vegetation. The hilly terrain and extreme shortage of developable land have resulted in a compact, densely built-up urban fabric with few openings, let alone plantable ones. Tree growth is severely constrained in the pervasively crowded and bleak environment.[3]

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* I acknowledge with gratitude the support provided for this research by the Hui Oi Chow Trust Fund, administered by the University of Hong Kong.

[1] Rowan A. Rowntree, Configuration of Tree Canopy Cover in Urban Land Uses, *Geographical Perspective* 51 (1983): 49–53; Ian Douglas, The Urban Environment (London: Edward Arnold, 1983), 127–145; Ralph A. Sanders, Some Determinants of Urban Forest Structure, *Urban Ecology* 8 (1984): 13–27.

[2] A. Bernatzky, The Effect of Trees on the Urban Climate, *in* Trees in the 21st Century (edited by Arboricultural Association; Berkhampstead, U.K.: AB Academic Press, 1983), 59–75; L. M. Anderson and H. W. Schroeder, Application of Wildland Scenic Assessment Methods to the Urban Landscape, *Landscape Planning* 10 (1983): 219–237; J. A. Henry and S. E. Dicks, Association of Urban Temperatures with Land Use and Surface Materials, *Landscape and Urban Planning* 14 (1986): 21–29; A. S. Goudie, The Integration of Human and Physical Geography, *Transactions of the Institute of British Geographers* New Series 11 (1986): 454–458.

[3] C. Y. Jim, Street Trees in High-Density Urban Hong Kong, *Journal of Arboriculture* 12 (1986): 257–263.

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Nevertheless, a surprisingly large number of small woodland patches is scattered throughout the sloping enclaves of the city. This study has four objectives: to map tree-canopy cover in Hong Kong at a large scale with data from low-altitude aerial photographs, to characterize the configuration of the canopy cover on the basis of its observable and measurable attributes in a classification scheme and terminology, to evaluate the spatial variations in the cover and configuration, and to explore the dynamic areal associations between canopy characteristics and urban development and their implications for urban planning.

Study Area

The main urbanized areas of Hong Kong are the old core and subsequent extension around the harbor (Figs. 1 and 2). The heavily and almost continuously built-up tracts contain the commercial and administrative functions as well as two-thirds of the total population of 5.6 million. The terrain is chiefly steeply sloped hills and, initially, narrow coastal flats that impose severe constraints on urban development. Urban growth began on the narrow shore and expanded by successive phases of reclamation from the sea in conjunction with upslope sprawl by terracing.[4] Where the slopes were geotechnically or economically not developable, pockets usually with good vegetative cover remained in the otherwise contiguous urban matrix. Occasionally, wooded slopes were statutorily delimited as greenbelts.[5] The overall form of development was molded by landforms onto which landuse and density zones were superimposed.

Three geographical divisions may be identified. Hong Kong island, with an area of 7,772 hectares and 35 percent of the developed area, has steep, sparsely populated hills where parks have been designated. In contrast, the low granitic hills, originally stretching across the center of Kowloon peninsula, have been extensively leveled or terraced for urban expansion.[6] Subsequent extension of urbanization mainly after World War II toward the north and east created New Kowloon, where steep, flanking hills checked expansion. Approximately 70 percent of the total area of 4,554 hectares that constitutes Kowloon peninsula and New Kowloon has been developed.

The original climax vegetation, now almost completely removed, was probably monsoonal facies of the lowland tropical rain forest.[7] Forest cover has been reduced over the centuries by shifting cultivators, sedentary farmers,

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[4] T. R. Tregear and L. Barry, The Development of Hong Kong and Kowloon as Told in Maps (Hong Kong: Hong Kong University Press, 1959).
[5] Town Planning in Hong Kong, Lands Department, Town Planning Division, Hong Kong, 1984.
[6] Geotechnical Area Studies Programme—Hong Kong and Kowloon, Report 1, Civil Engineering Services Department, Hong Kong, 1987.
[7] L. B. Thrower, The Vegetation of Hong Kong, *in* The Vegetation of Hong Kong (edited by L. B. Thrower; Hong Kong: Royal Asiatic Society, 1975), 21–43; C. W. Wang, The Forests of China, Publication Series No. 5, Maria Moors Cabot Foundation, Harvard University, Cambridge, Mass., 1961.

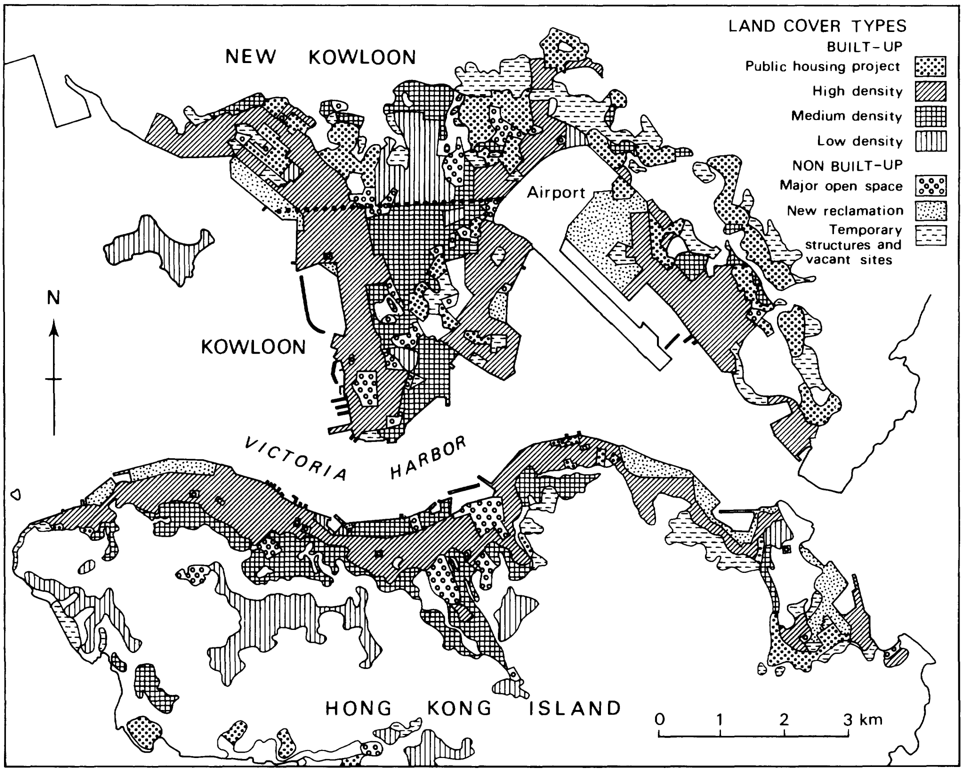

FIG. 1—Structural-cover types in study area, including urbanized lands around the harbor.

and, in recent decades, countryside recreationalists.[8] Despite assiduous afforestation efforts during the twentieth century, woodland cover, which is concentrated in reservoir catchments, has remained at approximately 11 percent throughout the postwar period.

The species composition of urban trees, in contrast with that in temperate-latitude cities, is diversified. It is a heterogeneous mixture of both native and introduced species of varied provenance. Only a small proportion of the arboreal population situated on formerly wooded slopes constitutes relics from preurbanization. Without a clear policy to preserve existent trees in places affected by urban intrusions, very few specimens would be saved. Twenty-six surviving indigenous species have been identified in the built-up area. Most trees in developed parts of the city are cultivated, with exotics being overwhelmingly dominant. The species were chosen not only for their ornamental and shading qualities but also for their tolerance of the stressful urban environment.[9] Many such species have been well proved for urban survival in southern Chinese and Southeast Asian cities.

[8] C. Y. Jim, The Country Parks Programme and Countryside Conservation in Hong Kong, *The Environmentalist* 6 (1986): 259–270.
[9] Jim, footnote 3 above.

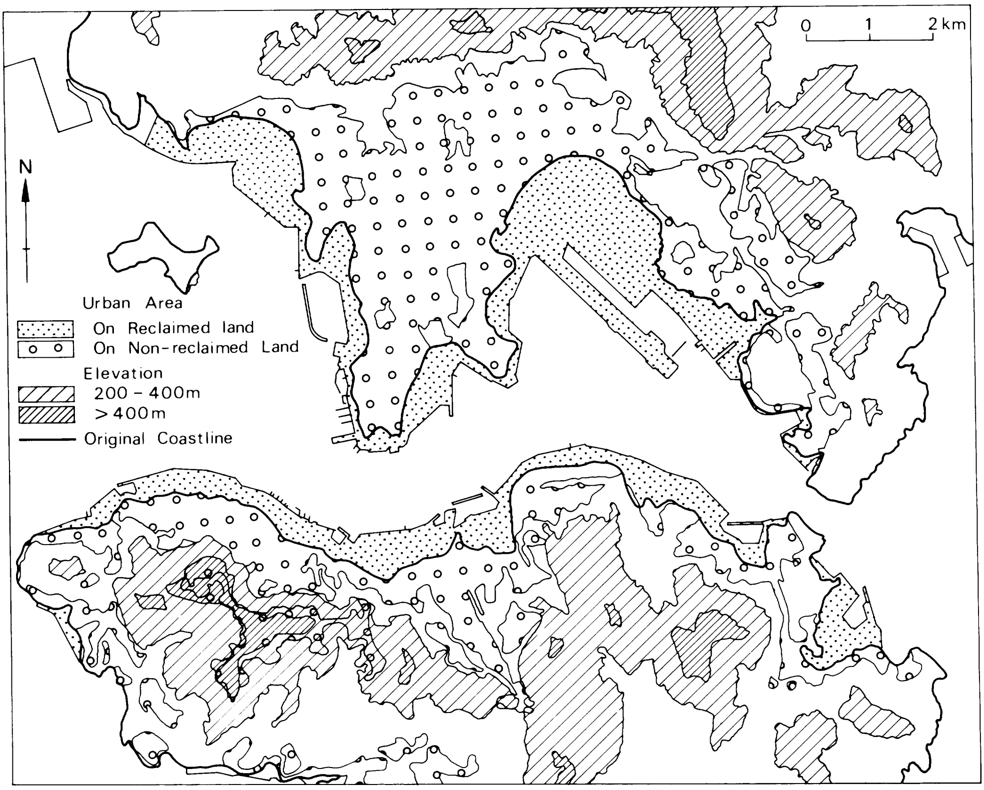

FIG. 2—Development on hillside and reclaimed areas.

METHODS

Three maps at a uniform final scale of 1:20,000 were prepared for this study. A land-cover map with nine categories emphasizing density of artificial structures and surfaces was drawn, supplemented by data from black-and-white aerial photographs, taken in 1986, at approximately 1:8,000, as well as from 1:2,500 and 1:5,000 maps and field verifications (Fig. 1 is the simplification of this map). A map for stages of urban growth for periods pre-1945, 1945–1963, 1964–1982, and post-1982, with respect to hillslope-site formation and reclamation from the sea, was prepared using old and new photographs and maps. Sixteen tree-canopy maps at 1:5,000 were prepared using the aforementioned aerial photographs and were subsequently combined into a single map at 1:20,000 (Fig. 3).

Four sets of categorical data were extracted from the maps: canopy coverage (C), canopy configuration (S), land cover (L), and urban-growth stages (U) (Table I and Figs. 4 and 5). A systematic sampling design using a one-centimeter-square grid was adopted. For L and U, a point-sampling strategy was used, whereas for C and S, one-square-centimeter quadrats, the equiv-

FIG. 3—Excerpt from a tree-cover map showing part of Kowloon peninsula.

alent of 0.04 square kilometer on the ground, were used; the quadrats were centered at the grid points. A sample of size 1,176 units for each of the four attributes, covering forty-seven square kilometers, was evaluated. Data analysis was performed on an IBM microcomputer using the Base and Advanced Statistics modules of the Statistical Package for the Social Scientists.

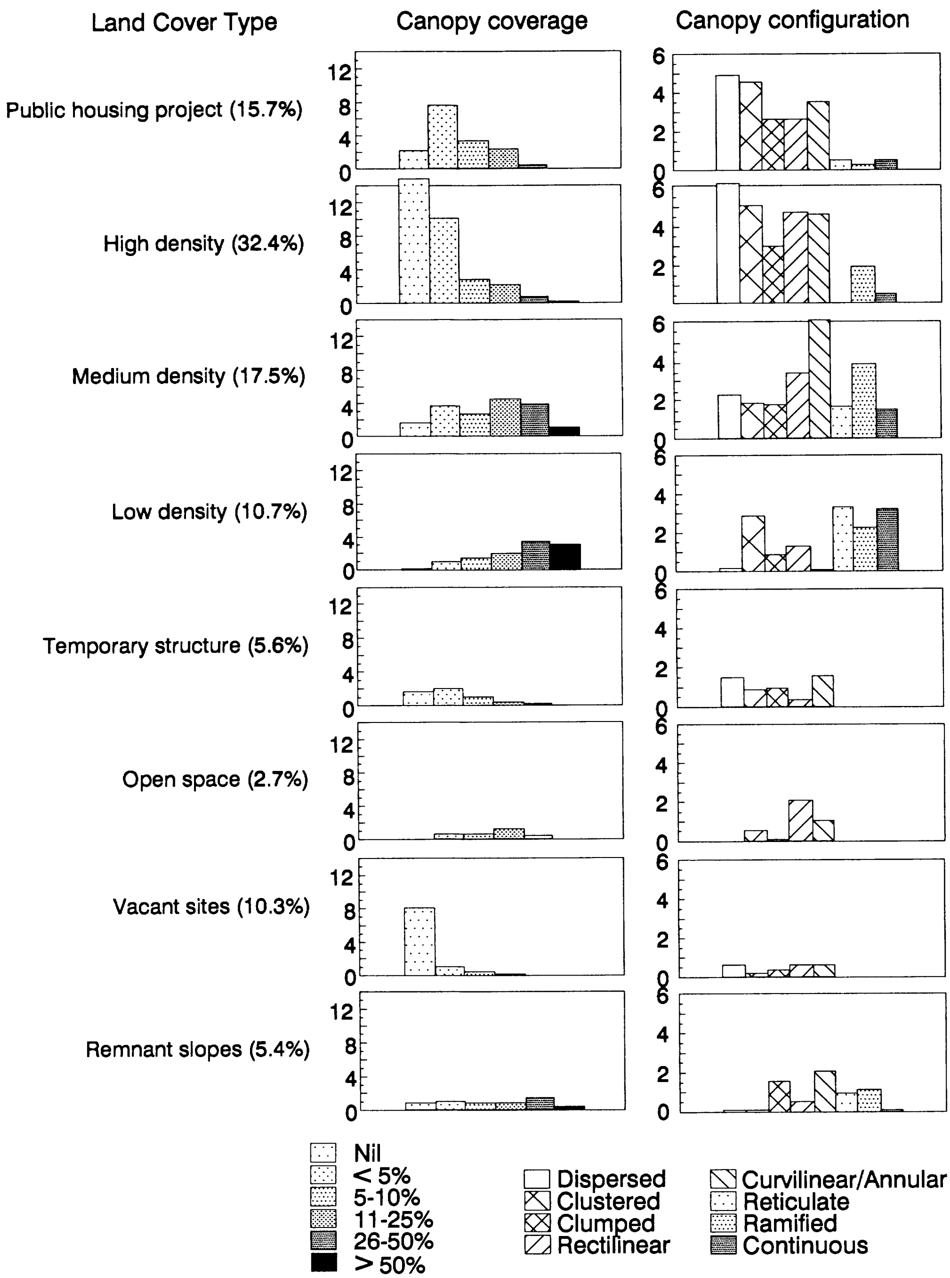

FIG. 4—Frequency distribution of canopy coverage and configuration classes in the eight landuse types. Percentages indicate area.

CLASSIFICATION AND CHARACTERISTICS OF TREE CANOPY

A host of habitat or ecosystem classifications has been proposed, but no comprehensive classification has been attempted specifically for urban tree cover.[10] The inherent geometric attributes of tree cover are adopted here as

[10] Douglas, footnote 1 above.

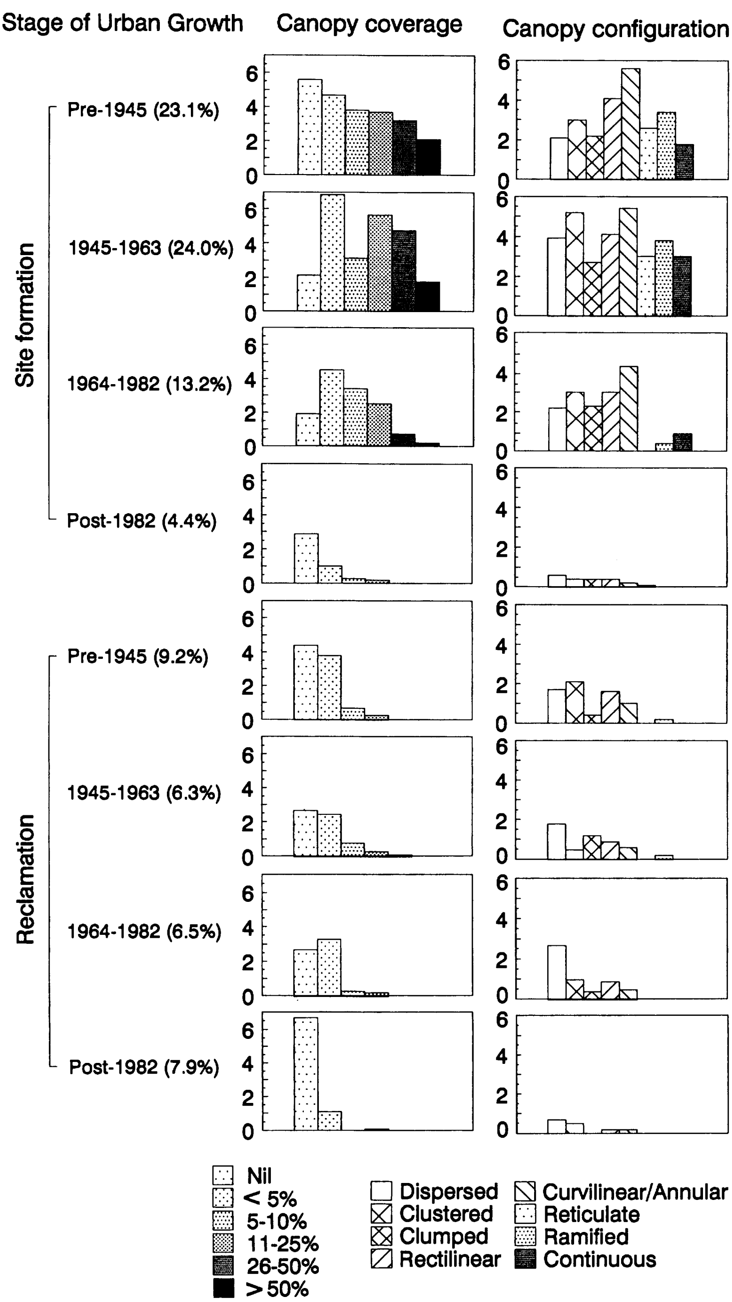

FIG. 5—Frequency distribution of canopy coverage and configuration classes in four urban-growth stages. Percentages indicate area.

classification criteria. The inclusion of less direct factors such as habitat type and environmental relationships, useful in other contexts, may detract from this study of spatial pattern. Using shape as the cardinal differentia, three groups of S, isolated, linear, and connected, can be identified. The increase in coverage, connectivity, and contiguity divides each group into three variants.

The nine categories of S are illustrated with actual examples excerpted from the tree-canopy map (Fig. 6). They are regarded as modal types in a continuum of spatial changes. The isolated types are dominated by artificial covers of buildings, roads, and other nonplantable impermeable materials. These manmade surfaces form a continuous matrix that encompasses the discrete and small units of C. The trees are trapped principally in scattered and cramped niches of roadside incidental spaces and occasionally of small yards on residential lots. The dispersed variant—the small and almost equidimensional units, mainly solitary trees—is widely scattered in the built matrix. The clustered variant has trees in small groupings often finely mixed

TABLE I—SAMPLING QUADRATS AND AREAS BY CANOPY COVERAGE AND CONFIGURATION

CLASS CODE	CLASS LABEL	QUADRATS (%)	AREA (km^2)
	Canopy Coverage		
1	no cover	29.7	14.0
2	<5%	29.1	13.7
3	5–10%	13.1	6.2
4	11–25%	13.6	6.4
5	26–50%	10.1	4.7
6	51–75%	2.6	1.2
7	>75%	2.0	0.9
	(total)	100.2	47.1
	Canopy Configuration		
0	no cover	29.7	14.0
1	dispersed	11.1	5.2
2	clustered	11.3	5.3
3	clumped	7.8	3.7
4	rectilinear	11.0	5.2
5	curvilinear	13.1	6.2
6	annular	0.9	0.4
7	reticulate	4.6	2.2
8	ramified	6.4	3.0
9	continuous	4.1	1.9
	(total)	100.0	47.1

with the built-up components. The aggregation of trees into larger units, chiefly courtyards or underdeveloped slopes, furnishes the clumped variant.

The linear types are marked by the juxtaposition of trees in one dominant direction in response to regimentation by elongated artificial habitats. The rectilinear variant is narrow, usually straight, and aligned along restricted roadside or lot-edge sites. This pattern follows the grid plan on level or leveled lands relatively free from topographic constraints. The curvilinear variant involves wide and often meandering belts on modified or natural slopes adjacent to roads. The control of slope on urban form and associated along-contour green spaces is evident. The annular variant is a special case of the curvilinear. Trees form a contiguous ring around small hills, the tops of which have been leveled for building. The flanking slopes are not de-

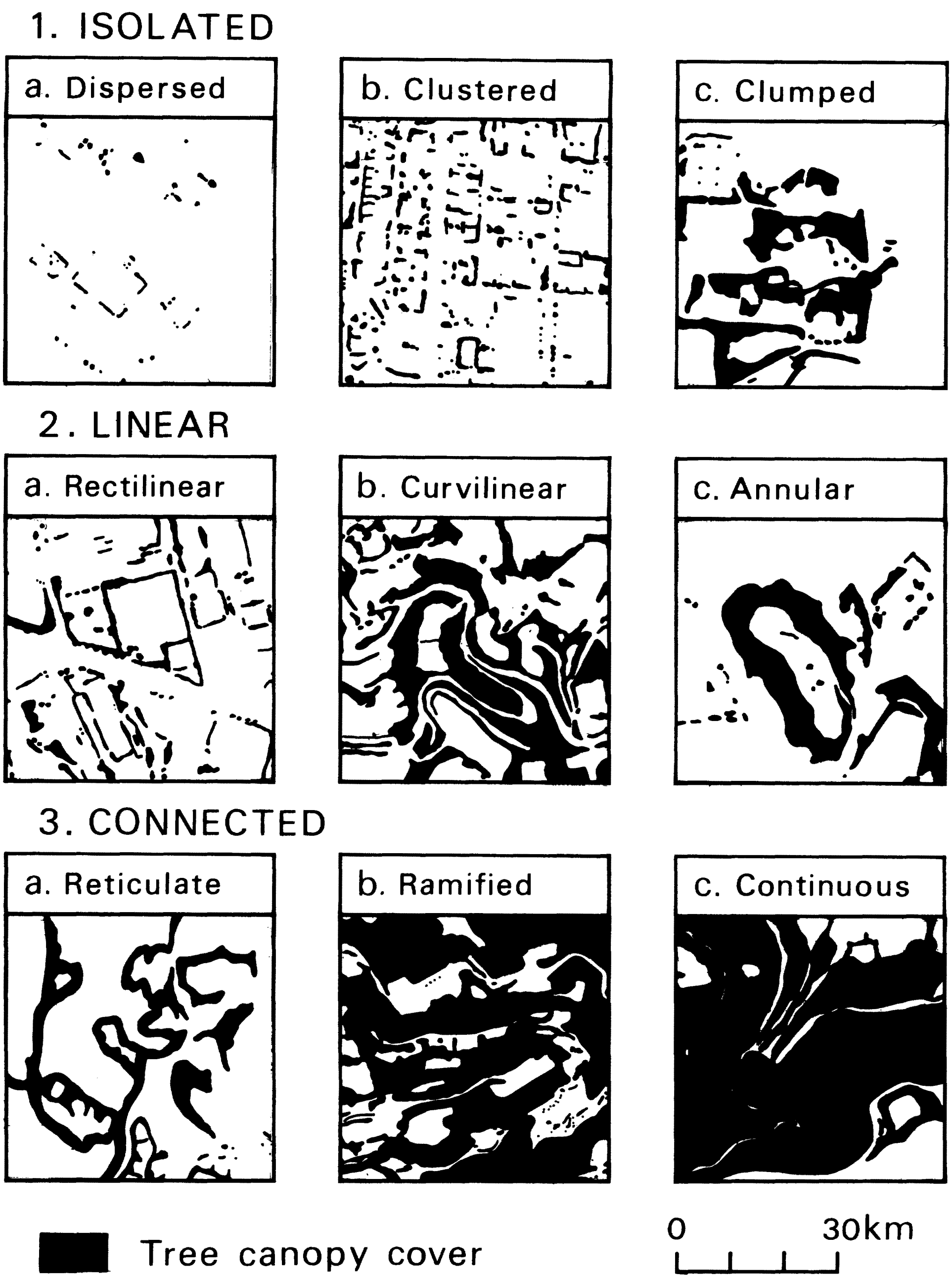

FIG. 6—Classification scheme for urban tree canopy.

veloped because of geotechnical limitations or greenbelt designation. Although most rectilinear trees are cultivated, curvilinear and annular ones are mainly inherited from preexistent woodlands.

The connected types have a high C and concomitantly a higher degree of connectivity and contiguity. Artificial plantings are subordinate to voluntary growths and remnant woodlands established before the inroad of urbanization. These valuable parcels of countryside in the city are concentrated on steeply sloped terrain at or near the city periphery. The canopy penetrates residential lots that are covered by both high-rise and low-rise structures. The reticulate variant has an elongated network that meanders through narrow interstices of undeveloped slopes between the rather closely packed buildings. The ramified variant has C of more than 50 percent. The interweaving canopy forms an unbroken framework that envelops the detached building lots. The continuous variant, with C of more than 75 percent, is essentially periurban woodland with a minimum intrusion by urbanization. The almost continuous canopy is punctuated only occasionally by isolated small buildings or narrow winding roads.

Distribution of C is uneven. Approximately 30 percent of the quadrats are treeless, more than 40 percent have less than 10 percent C, and slightly less than 5 percent have more than 50 percent C. There is a marked clustering of quadrats with trees in the hilly areas. On the contrary, large tracts of low-lying land mainly reclaimed from the sea are devoid of both trees and plantable sites. S is equally variable over space. The isolated types, especially the dispersed and clustered variants, are dominant, followed by the linear group, particularly rectilinear and curvilinear. The connected group accounts for 15 percent of the quadrats. The association between C and S is statistically significant. With increasing C, there is a distinct shift from a domination by isolated S to linear and connected.

LAND COVER AND CANOPY CHARACTERISTICS

The government builds public housing projects for low-income families chiefly at peripheral locations. A goal for project design is to concentrate residents in high-rise structures that may reach thirty stories. In these vertical, land-conserving developments, space between the individual buildings is often open and planted. The recently erected projects have integral landscape plans, and the older ones are being systematically redeveloped to meet improved standards for open spaces and planting. The specific spaces for plantings are small and scattered. They compete with a host of essential activities such as pedestrian and vehicular traffic and hard-surfaced recreational areas. The disparate habitats allow dominantly isolated S, especially dispersed and clustered variants, composed of solitary or small groups of trees. Linear S, edging open spaces and building platforms, is also well represented. Little attempt is made to provide an extensive and dense woodland-like cover. Overall, the living environment is much better than that in private tenement areas in the old districts.

High density, the most extensive L type, occurs primarily in low-lying areas. The extremely compact urban fabric here incurs a maximum utilization of space at the expense of environmental quality. Landuses are commercial, a mixture of lower-floor commercial and upper-floor residential, and industrial in high-rise structures. Almost all surfaces are either built up or covered by roads. Most pavements have some sort of artificial covering: arcades by old structures and awnings on new ones. Almost half of the quadrats are treeless, and the rest have scanty C. Trees are located in the few cramped roadside sites that yield linear S. Many were planted when development density and land value were lower. A few isolated specimens are planted on the occasional institutional lots that stand out from the otherwise ubiquitous 100 percent site coverage by buildings.

The high-density areas were developed without comprehensive or coordinated planning at times when social aspirations and priorities differed from those of the present.[11] The shortage of green and open spaces is also echoed in a grave absence of other social and community amenities.[12] A sizable proportion contains dilapidated structures erected before or shortly after World War II. These blighted districts are ripe for comprehensive renewal to alter the cramped, bleak environment. The insertion of greeneries at strategic locations is an important element of cityscape rejuvenation. The newly constituted Land Development Corporation, which is charged with coordinating redevelopment, can play a pivotal role in molding a renovated landscape.[13]

Medium-density areas occur principally on hillsides, especially on the northern foothills of Hong Kong island, the northern fringe of New Kowloon, and the central low hills of Kowloon peninsula. Landuse is almost exclusively high-rise residential structures for middle-income groups. Interstitial tree habitats are scattered among roads and buildings. Pockets of natural or undisturbed slopes are usually covered by relics of previous woodlands. Artificial slopes, shaped by either cut or fill, are planted or are invaded by voluntary species. Where land is level, roadside and front-yard trees are cultivated.

Almost 90 percent of the quadrats in medium-density areas contain trees chiefly in the 11–25 percent and 26–50 percent C classes. All three groups of S are well represented. The more prominent curvilinear variant reflects the terrain-controlled urban form. To minimize excavation and slope disturbance, roads and building lots are aligned on contours. The rectilinear variant lines the straightened artificial slopes that mark edges of building platforms made by cutting into hillsides. Quadrats with connected S are common. The ramified variant especially indicates woodland remnants where the urban front encroaches onto wooded slopes. The interweaving of green mantle and buildings creates a pleasant living environment. Unfortunately,

[11] K. S. Pun, Urban Planning in Hong Kong: Its Evolution since 1948, *Third World Planning Review* 6 (1984): 61–78.
[12] P. Hills, Environmental Protection in a Laissez-faire Community, *Built Environment* 11 (1985): 268–282.
[13] P. K. W. Fong, Issues in Urban Redevelopment: The Land Development Corporation, *Built Environment* 11 (1985): 284–294.

recent intensification of landuse associated with widespread piecemeal redevelopments threatens the existence of the green matrix. Not only are trees felled on or adjacent to construction sites, but also the need to widen roads brings havoc to the tree plantings.

Low-density land is concentrated in a few exclusive neighborhoods, characterized by detached houses with private gardens. C is highest among the eight L types; quadrats with high C (26–50 percent or more) outnumber those with low C. Connected S predominates on interstitial natural slopes found among the scattered houses. The pervasive extralot greeneries overshadow the intralot trees. Clustered S occurs on level land with adjoining lots where the cultivated trees in individual yards engender the clumped pattern. Landuse zoning, unlikely to be relaxed, will maintain the low-density sylvan character.

The few military barracks are included under low-density lands. The mainly low-rise and scattered buildings leave many intervening green spaces that contain many mature specimens with high amenity value. Fortunately some barrack sites that were returned to civilian use were converted into parks despite strong pressure for structural functions. The military lands have been subjected to a different approach to landuse and management. Decades of earnest desires to plant and preserve trees have bequeathed legacies of greenery zones that should be retained for public enjoyment.

Most vacant sites denote areal expansion of the city—large tracts of newly reclaimed land or platforms cut on hillsides. These new zones, though treeless at present, provide opportunities for planned insertion of green spaces according to new standards and aspirations. Some sites are vacant after demolition of old structures.

Only 2.7 percent of the sampled area is communal open space, chiefly as parks or sports fields. Despite the availability of generous growth spaces, most quadrats have low C. Lawns and playing fields, often with hard surfaces, are dominant. Principally linear S, both rectilinear and curvilinear, marks the edges of footpaths or playing fields. The absence of connected S is conspicuous.

Few remnant slopes exist within the city boundary. Many are elongated stretches situated near the city's uphill edge. Some are designated as greenbelts; most are left by default because of geotechnical constraints. The well-wooded slopes provide valuable breaks in the otherwise continuous built-up matrix. They also serve as wildlife refuge and penetration of nature into the city. Pressure to develop these green areas should be resisted. Temporary structures like illegal squatter huts perch precariously on hillsides bordering some built-up areas. The tightly packed huts leave little space for trees. Most squatter zones will be cleared for public housing in the future.

Urban Growth and Canopy Features

Because of the shortage of developable land, urban growth in Hong Kong followed two modes: site formation on building platforms made by cut or fill on hillsides, and reclamation from the sea. Both modes may be divided into four periods of growth. Approximately two-thirds of the sample area are attributed to site formation that prevailed over reclamation until the trend was reversed in the post-1982 period. One-third of the city area was developed before 1945, and another 30 percent was added between 1945 and 1963. The 1964–1982 stage saw a slowing in areal expansion because much growth was absorbed by the new towns.[14] In the post-1982 period, the pace of expansion rose again around the harbor, which presently is subject to a comprehensive redevelopment plan.[15] Besides areal spread by accretion, rapid reuse of developed lands in a comparatively short regeneration cycle is an important element of urban expansion.

The contribution of site formation to urban expansion has declined markedly after rapid growth between 1945 and 1963. As most suitable sites have been consumed after more than a century of continual development, attention must be focused on reclamation. Almost all quadrats with high C are associated with site formation. The pre-1945 and 1945–1963 areas, especially on Hong Kong island, are well endowed with interstitial woodlands, although many are small and disconnected. These wooded pockets are remnants of the formerly more continuous afforestation that began at the end of the nineteenth century shortly after the founding of the city.[16] Subsequent voluntary invasions by indigenous species have dramatically enriched the biotic diversity and physiognomy. A nearly continuous tract of such fine periurban woodlands now perches above the city on Hong Kong island.

The spatial pattern of U in these two early site-formation stages was favorable to tree survival. Building lots then were small, and developments were piecemeal. Excavations and slope disturbances were limited. Also the lots spread out on the hillsides and were separated by intervening natural slopes that allowed tree growth in basically linear and connected, especially ramified and continuous, forms. On some disturbed slopes, subsequent plantings and voluntary growths could reestablish a woodland cover within one or two decades.

Some negative forces are gradually reducing the permeating green-mantle characteristic of these two early site-formation stages. Redevelopments at high site coverage almost invariably eliminate all intralot and adjacent trees. Wooded slopes are often cut back and replaced by retaining walls. Building new roads and widening existent ones also decimate trees. Moreover, many interstitial wooded pockets are usurped for construction. Modern earth-moving equipment and the need for deep foundations for high-rise structures

[14] D. J. Dwyer, Landuse and Regional Planning Problems in the New Territories of Hong Kong, *Geographical Journal* 152 (1986): 232–242; J. M. Wigglesworth, Hong Kong's Approach to Planning for Major Urban Growth, *Habitat International* 10 (1986): 93–102.
[15] Metroplan—The Aims, Lands and Works Branch, Hong Kong, 1988.
[16] A. F. Robertson, A Review of Forestry in Hong Kong with Policy Recommendations (Hong Kong: Government Printer, 1953).

entail extensive fellings. A mitigating factor was induced by several catastrophic slope failures in the 1970s associated with rainstorms on colluvial and fill slopes in heavily built-up areas.[17] The subsequent moratorium on construction on large tracts of sloped land checked the excesses of development. However, the reprieve ended recently when development was allowed to resume, except in isolated zones of high risk.

The intensified landuse in the period 1964–1982 and since 1982 has left few habitats for trees. The drastic and destructive site-formation methods involve wholesale elimination of all vestiges of greeneries. The technique of constructing large platforms for both private and public housing projects that often cover hectares of land reduces the occurrence of intersite undeveloped slopes for trees. Consequently C, especially that with connected S, dwindled between 1964 and 1982 and disappeared in post-1982 areas. In some newly developed areas, the scattered young trees inserted at roadside, on narrow artificial slopes, and in local open spaces will take time to mature. Although the barren scene may improve in the future, such artificial plantings in confined and disconnected manmade habitats will have limited effect on the cityscape. Even on maturation, they are inferior to the highly desirable nature-in-the-city landscape with intertwined structures and wooded slopes characteristic of previous times.

In view of the recently imposed stringent controls on landuse and planning and of the ample chances to siphon off developmental pressures to new towns, the failure to emulate and to augment the existent penetration of greeneries is vexing. In addition to the statutory open-space standards for manicured urban parks and district-local rest areas, the preservation of natural areas as greenbelts at strategic locations should be mandatory.[18] In particular, slopes with woodlands of high amenity value are ideal candidates.

In terms of tree-deficient and overwhelmingly artificial streetscapes, the latest episode of site-formation lands resembles those produced by reclamation. The 1,400 hectares of reclaimed lands, which constitutes approximately 30 percent of the sampled area, have scanty C and a paucity of connected S. Most trees are situated either in narrow planting strips along a few truck roads or in the occasional parks and other communal open spaces. Elsewhere these lands reclaimed at high costs are routinely covered by a continuous myriad of buildings enmeshed by a grid of roads. The fully developable tracts, unlike the sloped areas, preclude the occurrence of interstitial niches. The tendency to plant additional trees began in the 1964–1982 stage. However, the visual and environmental effects of this restricted

[17] Final Report of the Commission of Inquiry into Rainstorm Disasters, 1972 (Hong Kong: Government Printer, 1972); Report on the Slope Failures at Sau Mau Ping, August 1976 (Hong Kong: Government Printer, 1977); C. L. So, Mass Movement Associated with the Rainstorm of June 1966 in Hong Kong, *Transactions of the Institute of British Geographers* 53 (1971): 55–65.
[18] Hong Kong Planning Standards and Guidelines—Information Pamphlet, Town Planning Division, Lands Department, Hong Kong, 1985.

coverage are unlikely to be significant. More vigorous implementation of landscape-corridor concepts in reclaimed areas is necessary to overhaul the cityscape.[19]

CONCLUSIONS

Trees in cities can be studied from synoptic and spatial viewpoints by using large-scale aerial photographs. Information thus obtained is related to the history of urban development and landuse. Limitations and changes to green-space penetrations and possibilities for future expansion can be identified. Classification of the tree canopy in terms of coverage and configuration helps characterize urban trees and their relationships to the built-up matrix and provides a framework for systematic studies and comparisons. Green spaces are recognized as integral components of livable cities with cascading benefits. It is perhaps paradoxical that in cities nature is most wanted and most lacking. Although the provision of green spaces is routinely advocated and implemented by the planning profession in developed countries, similar commitments are weakly expressed in many third-world countries.

This study of Hong Kong, a city characterized by high-density development, may provide general implications for other urban centers. Not only should additional greeneries be inserted into the urban matrix, but also they should be designed so that location and configuration allow them to envelop built-up sections. The recent trend to segregate green and artificial areas is undesirable. A connected framework of green corridors, parks, and open space can effectively enmesh these sections with a minimum amount of valuable urban land. Allocation of green space should make full use of natural endowments of a city, such as existent woodlands and undeveloped tracts. Preservation of self-maintaining natural enclaves is far more cost-effective than the expensive creation and upkeep of parks. A naturalistic approach is thus preferable to formal layouts dominated by horticultural design and species. Although vigorous application of planning principles and standards is under way for new developments, rehabilitation is possible in blighted districts to open the inordinately tight urban fabric.

Without a comprehensive landscape plan, and even with one in some instances, rapidly expanding third-world cities tend to grow relentlessly outward and upward to cause widespread environmental degradation. It does not make sense to decimate nature in one part of a city and to insert expensive but inadequate emulation of it elsewhere. It is ironic that 40 percent of the land in Hong Kong is inalienably protected as parkland, while destruction of natural areas continues apace in the city and on its fringes. Rather than these diametrically opposite policies, the same principles should

[19] Environmental Guidelines for Planning in Hong Kong, Environmental Protection Agency, Hong Kong, 1985.

be enlisted for conservation and enhancement of nature throughout the city area and the adjacent rural zones.

Socioeconomic exigencies and community values in the past might have induced negligence on the issue of environmental quality. However, the present enlightened generation can afford and deserves a better environment within the city. A bold departure from existent policies is necessary to modify the cityscape. Especially relevant to all third-world cities, the sacrifice of some economic efficacy and gains could bring substantial environmental improvement for the common good well into the future. The quality of an environment is a truthful measure of the cultural values harbored by the society that created it.