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PRIVATISATION, SECURITY AND COMMUNITY: HOW MASTER PLANNED ESTATES ARE CHANGING SUBURBAN AUSTRALIA

Goodbye to the Backyard? - The Minimisation of Private Open Space in the Australian Outer-Suburban Estate

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Abstract

Although a substantial backyard might be considered an iconic Australian feature, by the late 1990s, almost all new suburban houses had minimal provision of soft-landscaped private open space. This paper presents results of research that has investigated important aspects of this phenomenon. It has measured the changes on a sample basis and has attempted to relate the changes to their planning policy context. The environmental significance has been assessed in relation to the literature. Quantitative analyses of examples from older and newer suburban form are presented. They indicate that this is happening irrespective of size of lot and appears connected with a trend to larger dwellings in relation to the lots area. It represents a loss that has serious ecological implications for the community as a whole, including a significant reduction in biodiversity, sustainable drainage and a beneficent microclimate, in addition to lower standards of domestic amenity. It does not appear that the reduction in size is being required by planning polices. Planning codes, while not actually encouraging the trend, do nothing to prevent it. The phenomenon is to be found even under progressive planning regimes and in nearly all master-planned estates.

Introduction

In the early 1990s, a dramatic change in Australian suburban form began (Hall, 2007, 2008). The older areas are characterised by tree cover while, in the newer ones, large roof areas predominate and dwellings can be nearly roof-to-roof. This change has not been subtle or gradual in either space of time. It is a phenomenon that is immediately apparent from even a cursory examination of aerial photographs. This change is not something that relates to the backyards alone. House and street design have also changed as part of the same process. There has been a trend towards deep, square house plans possessing large internal spaces with little natural light and ventilation. There is also a trend towards fewer and smaller windows. The narrow gap around single-storey houses is dominated by high opaque fences. The frontage is dominated by integral garages.

This paper presents results of research that has investigated three aspects of the reduction in backyard provision. Firstly, it obtained a quantitative perspective on the exact nature of the changes that have appeared. Secondly, it assessed the environmental significance of the phenomenon in the light of the literature. Will the long-term effect be benign, neutral or adverse? Thirdly, it related the changes in backyard provision to the policies of the planning system within which the development is occurring. Is it happening as a result of planning policies or in spite of them? It is not suggested that these are the only questions that can be asked but they are the ones on which progress can now be reported.

New data describing this phenomenon obtained from an analysis of aerial photographs will be presented. Before this the 1990s, suburban form incorporated backyards of substantial size, useful shape and a significant coverage of trees. Lot coverages by houses were 20-30% with a maximum of 35-40%. After this period, provision of large backyards ceased and 35-40% now represented the minimum, rather than the maximum, lot coverage. Although there has been a trend to smaller lot sizes, the phenomenon appears independent of lot area.

It will be further argued from the literature that this change in suburban form has serious environmental consequences. The domestic backyard has an ecological function and importance that goes way beyond the interests of the individual household. The smaller proportion of the total land area that is permeable and planted will have an adverse affect on the local ecology and microclimate. An

examination of local planning regulations will also be presented. This provides little evidence that the changes are being driven by planning policy but it is clear that planning policy has done nothing to prevent it.

The research method

The first stage of the investigation (Hall, 2007, 2008) was the visual inspection of aerial photographs of Australian cities. This revealed a distinctive phenomenon. There was a clear-cut difference between older suburbs, characterised by contiguous private open space to the rear of properties with extensive tree cover and the newer residential developments with significantly less space between the dwellings. No recently-built examples with same characteristics of the older suburban form could be detected. Sample areas were then selected for detailed analysis from within the older and more recent residential suburbs of Sydney, Melbourne, Brisbane Adelaide and Perth. Measurements were made of the parameters of lots and building footprints from aerial photographs, including backyard area and lot coverage. At the same time, the approximate dates of subdivision and construction, and details of the local planning regulations that applied at that time, were sought. One reason for selecting examples from a number of cities was, hopefully, to take in a range of regulatory regimes. All the examples were inspected and photographed at ground level.

The details of the local planning regulations applying to the examples were reviewed in the light the planning policy documents relating to them at local government and state level. Note was also made of any Commonwealth government documents that might have influenced these over time.

As a separate but complementary exercise, the literature on the role of the private open space around the dwelling was studied. As the investigation proceeded, it became clear that this was an interdisciplinary task embracing on a wide range of ecological and behavioural studies.

The results of the analyses

The results of the analyses are set out in Tables 1-4. An issue in measurement was how to the count the land area occupied by verandas, pergolas and other lightweight structures that are now common as extensions to the Australian home. The terms *net footprint* and *net coverage* in the Tables refer solely to the original dwelling while the terms *gross footprint* and *gross coverage* refer to the dwelling plus the additional structures. The data for the area of the backyard refer only to that space open to the sun.

The data all show a consistent pattern. The older form was universal up until the late 1980s. It is possible to find developments constructed during the 1990s that take an intermediate position either by mixing the types or by having backyards that are smaller but still of usable size and shape. However, by the late 1990s, construction of the older form had ceased. The newer form appeared in increasing strength as the 1990s progressed and was predominant by 2000. If anything, its characteristics have become more extreme with time.

The traditional Australian backyard

The physical characteristics of the traditional Australian backyard were realised over the first 150 years from colonial settlement in the form of the detached cottage with a large yard on an allotment between 600 and 1200 square metres (Cunningham & Auster, 1996). Despite the obvious cliché of the ‘quarter acre block’ (1012m^2) which, although existing, is not, or has ever been, commonplace, the critical point is that, until comparatively recently, most suburban houses in Australia have had big backyards by world urban standards (Halkett, 1976; Seddon, 1997; Timms, 2006; Head and Muir, 2007). Based on the size of the genuine quarter-acre lot, and assuming a large house with site coverage of

200m^2, a backyard would be likely to be in the order of 500-600m^2. A standard sized block in the order of 600m^2, again assuming a large house with site coverage of 200m^2, would still be likely to accommodate a backyard in the order of 200m^2. This is confirmed by the examples shown in Tables 1 and 2. The average backyard area is over 200m^2 except for Hebesham, from the 1980s. Even here, 57% of the backyards are over 150m^2.

For a better appreciation of the implications of these figures, we can take a closer look at three of the examples from those listed in Tables 1 and 2. Figure 1 shows an aerial view of part of the suburb of Camp Hill Queensland (QLD). It lies 5.7 km southeast of the centre of Brisbane and was subdivided between 1945 and 1947. The houses are generally of the "Queenslander" type, the vernacular architecture of the State. The locality is particularly notable for the number of trees both in front and behind the houses. The backyards are of substantial size and usually include facilites for drying clothes, as shown by Figure 2. Figure 3 shows an aerial view of part of Hebersham NSW, subdivided in the 1980s. It is some 38 km west of the centre of Sydney. The majority of backyards have a significant area and a square shape. A number have swimming pools. Figure 4 shows an aerial view of part of the Perth suburb of Spearwood dating from the 1980s. It is just over 17 km south of the city centre. Most of the backyards are of substantial size and some accommodate a rainwater tank and swimming pool.

All three examples feature good rectangular backyards with trees. Only a few have areas less than 150m^2 and many are in excess of 300m^2. The proportion of the total lot covered by the dwelling footprint only occasionally exceeds 40% and, for a very large proportion, it is less than 30%. Net densities are 9-13 dph, low but not excessively so. It does not follow, however, that low density is solely due to the presence of large backyards. A significant determinant of the low residential densities is the very large front-to-front distances, in excess of 30m. Finally, A very important characteristic of the older suburban form that very clear from the aerial photographs, is the way that the backyards interconnect to the rear of the properties providing a nearly contiguous planted area.

Examples of the newer suburban form

Comparing Tables 3 and 4, detailing the more recent suburban form, with Tables 1 and 2, what is striking is the differences in value for lot coverage, backyard area and rear setback. Average net lot coverage is now between 39% and 56% compared with 22%-30%, gross lot coverage is 46%-52% compared with 29%-38% and setback distance 4m-7m compared with 12m-29m. Table 4 shows that the majority of backyard areas in all the newer examples were under 100m^2.

At first glance, 40-50% lot coverage may not seem too problematic. Would not this mean that half the lot could be garden? Half of a 600m^2 lot would be 300m^2 and 30% would be still be 180m^2. The actual situation is counter-intuitive. The calculation neglects two factors. The first is the aggregate amount of the narrow space left around the sides of the dwelling. Figure 5 shows a diagram of a house footprint with a 2m gap all around it. For a 300m^2 lot area, say 10m x 30m, this gap takes up 48% of the total area giving a lot-coverage of 52%. For a 600m^2 lot area, say 15m x 40m, the coverage is 66%. This narrow gap alone can take up 34-48% of the lot. If a dwelling covers half the area of a lot there will be little private amenity space of a useful size and shape. This issue is compounded when the space at the front of the dwelling is taken into account. A front setback of the dwelling from the front boundary of the lot is required in most of Australia. Once this is removed from the uncovered area, at 40-50% coverage very little remains at the back and sides.

For a closer look at the newer suburban form, three examples will now be described in more detail. Figure 6 shows an aerial view of a part of Mount Druitt

NSW, off Meacher Street, which was constructed in the mid-to-late 1990s to the south of the older Hebersham area previously described. The street scene is shown by Figure 7. Note the dominance of garage doors. In front of fenced front gardens is a wide unfenced grass area and carriageway. Some houses are comparatively modest in scale, or are on corner lots, permitting a fairly small backyard, but most have negligible open space at the rear.

The second example is taken from the Perth suburb of Spearwood but on the opposite side of the main road to the older subdivision described earlier and shown by Figure 4. An aerial view is shown by Figure 8. What is especially remarkable for this example is the low density and large lot sizes. At 13.6 dph the density is nearer to the older suburbs than to the two other recent examples but this has not resulted in the same amount of green space. At over 600m^2, the lots are the same scale as those in the older Brisbane suburb of Camp Hill QLD. While the lot dimensions are large, so are the house footprints. Consequently, the backyards are very small, especially in comparison to the house and lot size. Some of the houses are almost entirely surrounded by others. The street scene, illustrated by Figure 9, is dominated by large paved areas and by wide garage doors. There are few windows and little surveillance of the pubic realm and sense of enclosure of space.

Springfield Lakes is an extensive master-planned development on land lying over 23km southwest of the centre of Brisbane. The land was cleared in 2000 and construction has continued for nearly ten years. Figure 10 shows an aerial view of part that was completed in 2002. Lot and dwelling size show some variation. Some properties have a distance of 6-8m at the rear of the house, resulting in a fairly useful back garden, but many have only 2-3m. For 70% of the properties, the net coverage of each lot by the dwelling footprint, not counting the lightweight extensions, is over 40%. Most have very little space at the back, 93% less than 100m² and 68% less than 50m². The street scene is dominated by garages, unfenced front lawns with hard standings and a wide road reservation. Note the view of the arrangements at the side and rear of a dwelling that is revealed by Figure 11. The meagre space around the house and lack of windows can be clearly seen. The exposure of the side boundary fence is poor for security and unsightly for the street scene. The strip of land in front of it has no apparent use.

The issues raised by the examples

As we have seen, the older type of suburban form is characterised by substantial backyards of at least 150m^2 and they may easily be several times this figure. In contrast, in the newer suburbs, although some properties may have backyards of 100m^2 they are normally much smaller than this and are commonly less than 50m^2 in area. Not only this, but the narrowness of the gap between the dwelling and the side and rear boundaries of the lot frequently results in this area being in the form of a long strip rather than a more useful square shape.

A common response to these figures is that they must be the result of smaller lot sizes, probably resulting from planning strategies directed at urban consolidation. Writers such as Patrick Troy (1996) have warned of the adverse consequences of such policies. There is, indeed, a trend to smaller lot sizes in Australia but a closer examination of the data reveals that this not the cause of the phenomenon. What the Tables show is that, for the examples studied, is that where the lot area is large so is the house footprint. Note that the lot-size distribution for the new section of Spearwood WA is, at around 600m^2, almost identical to that for the older Queenslanders at Camp Hill QLD. Statistics at the national level (ABS, 2005) show a substantial rise in the floor area of new houses since the 1980s. From a figure of 162.2 m^2 in 1984-5, by 2003-4 the average floor area had risen to 227.6m^2, an increase of 40%. The increase in the ten-year period from 1993-4 to 2003-4 was just over 20%. The average lot area also

declined over the same ten-year period, from 802m^2 in 1993-4 to 735 m^2 in 2003-4 (ABS, 2004). However, this is still a large figure and the evidence suggests that it is the increase in the dwelling area, rather than the decrease in the lot area, that has driving the diminution of the backyard.

What also seems to be happening is that the changes in the size and shape of the backyard is closely associated with changes to the design of the house. As is revealed by the aerial photographs, many of the houses in the newer suburbs are deep-plan, in other words there is a considerable distance from the front to the back. Many are also square in plan, with the side-to-side dimensions also being large. The street views reveal that they are predominantly single-storey and that integral garages are almost universal. An integral garage, as opposed to an open carport or detached garage, has the effect of reducing the natural light and ventilation to the interior of the dwelling. Windows are often small and few in number. There is little outlook from the windows for the occupants to enjoy. As the houses are now much closer to each other, to maintain privacy, fences must be high and opaque preventing any visual contact between neighbours. The sum of all these characteristics is that the houses have a significant proportion of the interior space some distance from windows which will be difficult to light and ventilate naturally. The large roof areas will absorb heat in summer, which must be expelled by air-conditioners, and lose it in winter but the dwelling will not be able replace it with solar gain.

The role of green space around the dwelling

The evidence from the studies that will be cited below suggests that the green space around dwellings plays an important environmental role in the urban landscape. This is particularly associated with the nearly contiguous planted area that they form to the rear of the properties. The environmental functions of private gardens and yards benefit the interests of the wider community as well the quality of life of individual households.

Biodiversity

The interconnecting area of soft landscaping created by adjoining backyards hosts a high degree of biodiversity. The density and variety of the planting in a domestic garden is something that is not found elsewhere. Authors have remarked upon the number of plant species to be found in back gardens in European cities (Gilbert, 1991; Pysek, 1989). Owen (1975) has argued strongly for the high degree of biodiversity in the English garden on the basis of her studies of insect life. Cannon (1999), taking an international perspective, has drawn attention to the importance of the private garden for bird life.

Turning to Australia, the same situation is to be found. For example, Daniels and Kirkpatrick (2006) have drawn attention to the important role played by back gardens in the conservation of bird species in Hobart. Taylor, Leach and Smith (2006) found more than 300 plant species found growing on some suburban housing blocks in Adelaide. The minimisation, and even elimination, of the contiguous planted areas behind dwellings can, therefore, have potentially serious consequences for biodiversity in general. Indeed, studies in South East Queensland (Moroney and Jones, 2006) have drawn attention to how decreasing lot sizes have shown such a reduction in biodiversity. Once lost, species may take many decades to re-establish themselves or may disappear form the area forever.

Natural drainage

The reduction in the extent of planted areas to the sides and rear of the dwelling is not just a matter of fewer trees. It represents a loss of vegetation in general and its replacement by contiguous paved and built areas. There is,

consequently, less permeable surface area to absorb rainfall. In aggregate, this increases storm water run-off, a matter that has serious implications. The most direct consequence is the increase in cost arising from expenditure on concrete storm drains, not just for the development itself but also for other communities "downstream" of it. It also represents a loss of water that could have been used to support local planting and so encourage biodiversity. A number of American studies (McPherson *et al*, 2005) have revealed the contribution of urban trees to the reducing storm water run-off and the financial benefits that accrue from this. This is an issue that is particularly important for the Australian climate where long dry spells can be punctuated with episodes of heavy rainfall. Moreover, it is not helping moves to establish interconnected systems of sustainable drainage whereby water is collected by local swales and ponds. Such water features not only bring financial and ecological advantages but also enhance the aesthetic appeal of residential schemes.

Carbon sequestration and pollutant removal

One of the advantages of the planted areas created by contiguous backyards and other urban spaces is sequestration of carbon dioxide, and various other pollutants, from the atmosphere. This role of urban vegetation has been confirmed by a number of scientific studies in America (Nowak and Crane, 2002, McPherson *et al*, 2005; Pouyat, Yesilonis and Nowak, 2006, Golubiewski, 2006). Turning to Australia, Coutts, Beringer and Tapper (2007) have shown how urban vegetation in Melbourne plays an important role in mitigating the carbon emissions in that city. Studies by the City Council in Brisbane (Plant, 2006) found that, in 2000, Brisbane's residential tree cover was estimated to be absorbing the equivalent amount of carbon dioxide emitted by 30,000 cars per year. Although most, but not all, of outer suburban houses have front lawns, there is little tree cover. The reduction in the contiguous planted areas to the rear, and their replacement by buildings and hard landscaping, will reduce carbon sequestration just when and where it is most needed.

Natural climate control

Trees, plants and water are important for a beneficent microclimate, especially in the hot and dry circumstances of Australia. For example, studies by Brisbane City Council (Plant, 2006) found that residential tree cover cooled surface temperatures in the relatively mild month of October 1999 by up to 5 degrees Celsius. When applying the effects of tree shade on the eastern and western sides of a single-storey, 3 star energy-rated home, energy savings of up to 50% per annum could be achieved.

The reduction in width between dwellings makes natural ventilation very difficult. A study of suburban development in the Douglas area of Townsville (Lee Su San, 1998) revealed that the narrowness of the gaps between the houses prevented airflow around them, creating a "heat island effect". Her studies of actual buildings confirmed previous experimental results from wind-tunnel tests with models of buildings (Lee, Hussain and Soliman, 1980). They showed that the prevailing winds skim over the roofs without exerting air pressure within the gaps to force natural ventilation. Natural ventilation of houses from the wind is increased if the buildings are two, rather than one, storey high. The problem is exacerbated by the exhaust from the air conditioners and use of dark coloured roofs which absorbed, rather than reflected, the heat. The use of impervious sheet metal fencing, rather than, open link fencing, was also a factor in reducing airflow (Lee, Hussain and Soliman, 1980).

Benefits to the individual household

In addition to the benefits to the community as a whole, the backyard provides important benefits to the individual household. The most important ones, those

relating to outlook and ventilation, apply even if the occupants never venture out into their back garden. One of the most important roles of private open space around the home is to provide a pleasant outlook from inside the dwelling. Studies in medical settings (Moore, 1981; Ulrich, 1981, 1984) have shown that a pleasant view and natural sunlight can have beneficial effect on personal health and well-being. This is an important issue for quality of life.

Where the backyard has been reduced in size, or even eliminated altogether, the degree of enjoyment of the house by its occupants is, consequently, reduced. The space around the new outer-suburban house is now rarely able to accommodate an in-ground swimming pool. Barbecues may be possible but the space is limited and large social gatherings may be very restricted, as would other outdoor dining events. Home food production is not practical and accommodating large external rainwater tanks and home composters very difficult. For many there is no room for a Hill's Hoist and the ability to dry laundry in the open air can be very limited.

The are significant consequences for children as there is little space for them to run around make a noise without disturbing others while, at the same time, remaining in a secure environment with a responsible adult keeping watch from inside the house. This is especially important for very young children. A study by Flinders University (Spurrier, Magarey, Golley, Curnow and Sawyer, 2008) has pointed to less physical activity where children lack access to significant backyards. This was not compensated for by public open space and playgrounds. The authors saw this as leading to sedentary lifestyles and childhood obesity.

The role of public and semi-public open space

It is important to distinguish the role of the backyard from those of the front yard and the public park. They all share the ability to provide biodiversity, aesthetic pleasure and a beneficial microclimate. The front garden can certainly have an important role (Hall, 2006). The public park has an even more important one, particularly because of the larger-scale recreational opportunities it affords. In Australia, it can provide the location for gatherings of significant number of friends and family for barbecues. However, the front garden is semi-private (or semi-public) and the park completely public. They cannot offer the same privacy and degree of security as the backyard. This is particularly important as far as very young children are concerned. In addition, a public park cannot provide ventilation and outlook for all the houses. Although essential for urban amenity, it cannot replace the backyard in respect of the environmental functions discussed above.

In summary, the green space around all dwellings has important social and environmental functions and is an essential component of sustainable living. Urban amenity is not just a matter of provision of public parks but how private planted areas are integrated within the urban fabric.

The role of local planning regulations

Given the clear-cut spatial and temporal characteristics of the phenomenon described, what has been the role of local planning regulations in the process of change? Did they require it or merely allow it? The parameters that have changed, for example lot coverage and distances between dwellings and lot boundaries are the very quantities that such regulations normally deal with.

What is remarkable is how the diminution of the size of the backyard has been occurring over the whole of Australia. This is despite a significant variation in both the scope and details of plans and regulatory instruments across the many planning authorities. As the problem appears to be national in its scope, the first

place to look for answers is the guidance given by the federal government. Between 1977 and 1995 it showed concern with how residential development could exhibit affordability and amenity, resulting in several versions of the *Australian Model Code for Residential Development* (AMCORD). The last was AMCORD 1995 (Green Street Joint Venture, 1995). This opted for a private open space provision of a minimum of 20% of the site area. However, an area of space in aggregate may not equate to the actual area of a backyard as commonly understood. As explained by Figure 5, a narrow strip around a house can amount to 34-48% of the lot. The provisions therefore included an additional minimum dimension for a useful backyard, the *principal area* of 25m^2. The minimum linear dimensions were 4m x 4m. What is remarkable is not only how small these sizes are compared with the dimensions of older suburban yards given in Table 1, but also that they are also smaller than the yard sizes for the more recent suburban examples given in Table 3. No empirical justification was offered for these figures.

AMCORD was only advisory and there has be no equivalent initiative at federal level since. Requirements for residential private open space are largely enforced through building and development codes by state governments and local councils. There are certain parameters that nearly all codes, where they exist, specify, no matter how simple they are. Most codes specify maximum requirements for lot coverage as a total percentage of lot area. A maximum figure of 50% is very common. As is demonstrated by Figure 5 and the data in the Tables, this is insufficient to prevent the erosion of the backyard. To maintain a useful size of backyard, the upper limit would need to be at most 40%, ideally 30%. In addition, there is normally a minimum distance required between the edge of a building and the edge of the lot. At the sides and rear boundaries, this minimum distance is usually just 1-2m. To maintain a proper size and shape of backyard of the dimension set out in Table 1, a rear setback of at least 8-10m would be necessary. In addition, the codes normally require that a dwelling must be set back a certain distance from the lot boundary adjoining the road reservation, typically 4-6m. The requirement for a large amount of space to the front of dwellings is a tradition that is maintained in the newer suburbs and is a major contributor to low residential densities. Consequently, the space at the front now often exceeds that at the back.

New South Wales

Mount Druitt lies within the Blacktown LGA. During the 1980s and 1990s, there were no minimum requirements for private open space provision and therefore nothing to prevent the situation in the example off Meacher Street described. In 2006, the Council introduced the Blacktown Development Control Plan (Blacktown 2006) which specified a minimum private open space provision of 80m^2 behind the building line containing a minimum a space of 6m x 4m. Although this step could be seen as correcting the previous situation, its content is not very generous compared to the backyard sizes in the older suburbs.

Queensland

Except where varied by an approved local plan, all new housing in Queensland is subject to the Queensland Development Code (Queensland, 2007). The Code specifies minimum building clearances around the boundaries of a lot. These vary according to circumstance but in no case exceed 2m. The maximum site coverage permitted for the dwelling footprint is 50%. For lots under 450m^2 in area, an outdoor space is required at the rear of the dwelling with a minimum area of 16m^2 and minimum dimensions of 4m x 4m, reflecting the AMCORD principal area. What is interesting here is, firstly, that the idea that it is proper to for a Code to specify such space is conceded and, secondly, how small it is. For

lots greater in area than 450m^{2,} no minimum dimensions for a rear yard are specified at all.

The Springfield Lakes example lies just over the Brisbane City boundary within the Ipswich City LGA. Its design was regulated by the *Springfield Lakes Design Manual* (Ipswich, 1997) which was drawn up jointly by the Council and the developers. Its expectation is "predominately private yards" but the lot coverage maximum is given as 50-60%, in excess of the Queensland code. Later in the manual there is a specific requirement for provision for "subtropical outdoor living": an "indoor/ outdoor roofed room accessible from the main living area and exposed to natural ventilation and winter sun". However, the minimum area is only 25m^2, or 12m^2 if a deck, with no requirement for planting.

Western Australia

Provisions for the control of suburban form in Western Australia arguably represent some of the highest standards in Australia to date. Moreover, nearly all the current urban expansion of the greater Perth region is now in the form of master-planned estates. Western Australia's design policy, *Liveable Neighbourhoods* (WPAC, 2004) was, and possibly still is, the only one in the country that has actually tried to ensure that all urban form is laid out in accordance with a comprehensive design vision. It is now compulsory for all new development in Western Australia to comply with the code. However, it does not regulate the design of dwellings and the disposition within the lot. These matters are covered by the separate *Residential Design Codes of Western Australia* (WPAC, 2002) known as the R-Codes.

The R-Codes recognise the importance of private open space around the dwelling. The open space referred to includes that at the front and sides of the dwelling as well as that at the rear and so, sensibly, the codes require the provision of an *outdoor living area* within it. They do not say explicitly that the outdoor living area should be to the rear, or in another location where the users would enjoy privacy. The objectives are consistent with large backyards but, as with other examples discussed, the problem comes not with the general intentions but with the actual quantities specified. Minimum areas of outdoor space around the house range from 16m^2, for lots up to 200m^2, to 36m^2, for lots up to 580m^2. Above 580m^2 no minimum value is specified. Unfortunately, as we have seen at Spearwood WA, the lots over 600m^2 now present some of the most extreme cases and are direly in need of a minimum standard.

Minimum site coverages for the outdoor living space range from 45% to 50%. However, we have already seen, a narrow strip around the house can easily absorb both this proportion and also the minimum area figures of 24-36m^2. A specification of minimum width and length is, therefore, essential. In this case, it is only 4m x 4m, possibly taking its cue from the AMCORD provisions. Although the sentiments in the R-Codes are very positive, their translation into quantities is minimalist.

Master Planned Estates

There is no evidence that Master Planned Estates have brought about the reduction in size and shape of backyards but neither have they done anything to prevent it. The example at Springfield Lakes is a master-planned estate. In their very useful contribution to understanding the definition of the master-planned estate, McGuirk and Dowling (2007) described nine examples in the greater Sydney area. Aside from one which was on rural one-acre lots, visual examination of aerial photographs of their case studies as part of this research revealed that they all followed the same pattern of minimal backyard size.

In Western Australia, not only did the R-Codes not prevent the example at Spearwood discussed previously, but they have not ensured planted private space around the houses on the extensive new master-planned estates around Perth. Visual examination of aerial photographs showed that not only do they all have minimal backyards but some, such as Ascot Waters and Joondalup, are extreme in this regard. Figure 12 shows a view within the Ascot Waters development. The large size of the house and the lack of space around it are immediately clear.

Conclusion

Up until the 1980s, the physical form of the Australian suburb was characterised by detached houses taking up a third, or less, of the lot and facilitating a large backyards of 150m^2 to 400m^2. Such spaces accommodate a wide range of activities but their role is not confined to the individual lot. Planted areas adjacent to dwellings not only facilitate a pleasant outlook for the occupants but provide shade from the sun and assist the natural ventilation of the house. They also provide a secure play area for young children and space for social facilities for all ages. The backyards coalesce to form contiguous planted areas to the rear of properties which are important for biodiversity, sustainable drainage, an equable microclimate and the sequestration of carbon dioxide and other pollutants.

During the 1990s, the physical form of new suburban development in Australia changed dramatically. Houses with large backyards ceased to be built. Suburban form since then has been characterised by dwellings which cover at least 40% of the lot. Such houses have a deep or square plan with minimum wall length, few windows, an integral garage, often single-storey. These trends have resulted in a diminution of the backyard in both shape and total area. This has reduced the amenity of the property in terms of outlook from the dwelling and facilities for outdoor recreation around the home, especially for young children. However, the disadvantages go way beyond the lifestyles of the occupants. There is a loss of biodiversity and an increase in run-off of storm water. The microclimate becomes hotter and this, in turn, requires more air-conditioning and increased energy use. Moreover, it represents a permanent change in building form that cannot be corrected later.

There is no evidence that this trend has been brought about directly by policies of urban consolidation. It is to be found in lower-density outer suburbs and master-planned estates located a considerable distance from city centres. Although lot areas have become smaller overall, the phenomenon is to be found at all lot sizes. Local policies and planning regulations have not explicitly required small backyards. The provisions for private open space in development codes are minima not maxima. Had developers, property owners or builders, or any other parties involved, wished to continued to provide backyards on the scale seen before the 1990s, there was nothing in the codes to prevent them from doing so. However, whatever may have been the intention behind the codes, there was nothing in them to prevent the reduction in the size of private open space that has occurred. They have contained no provisions that would have retained the large backyards.

The environmental disadvantages of the reduction in private open space have been set out. However, this should not be seen as then end of the story. The issue begs many questions for further research. It is a topic on which, hopefully, future enquiry and debate can be focussed with advantage.

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Table 1 - Dimensions of selected examples from older Australian suburbs

		Caringbah NSW 1900s	Kew East VIC 1930s	Camp Hill QLD 1940s	Jannali NSW 1950s	Hebersham NSW 1980s	Spearwood WA 1980s
distance from city centre	km	21	9	5.7	22	38	17
net density	dph	8	11.6	11	13.4	13	9.3
typical front-to-front distance	m	35	29	30	32	34	33
average lot area	m²	1120	833	628	560	579	670
net average dwelling footprint	m²	207	215	165	130	132	196
average net lot coverage	%	22	26	27	23	23	30
gross average dwelling footprint	m²	283	268	181	198	201	249
average gross lot coverage	%	30	33	29	34	35	38
average backyard area	m²	419	311	268	220	169	202
average rear setback	m	17	19	29	23	12	14

Table 2 - Distribution of backyard sizes in the examples of older Australian suburbs

	Caringbah NSW 1900s	Kew East VIC 1930s	Camp Hill QLD 1940s	Jannali NSW 1950s	Hebersham NSW 1980s	Spearwood WA 1980s
m²	%	%	%	%	%	%
0-49	2	0	0	0	0	9
50-99	4	4	7	0	11	17
100-149	6	7	4	18	32	4
150-199	4	8	11	21	21	22
200-249	6	12	22	34	32	13
250-299	6	23	19	18	4	4
300-349	2	12	19	3	0	22
350-399	2	8	4	3	0	9
400-449	10	12	11	0	0	0
450-499	16	8	4	0	0	0
500-549	18	7	0	3	0	0
550-599	18	0	0	0	0	0
600-649	6	0	0	0	0	0

Table 3 - Dimensions of recent examples from outer suburbs

		Springfield Lakes QLD	Meadow Heights VIC	Mount Druitt NSW Rooty Hill	Mount Druitt NSW Meacher St	Blakeview SA	Smithfield Plains SA 2000s	Spearwood WA
distance from city centre	km	23	18	38	38	30	30	17
net density	dph	16	19	19	18	16	22	14
typical front-to-front distance	m	23	24	25	23	25	23	24
average lot area	m²	556	393	378	411	492	352	569
average net dwelling footprint	m²	231	163	146	171	212	144	281
average net lot coverage	%	44	41	39	42	44	42	50
average gross dwelling footprint	m²	239	189	169	209	242	155	314
average gross lot coverage	%	46	46	45	52	50	46	56
average backyard area	m²	113	99	74	74	111	84	46
average rear setback	m	6	7	5	4	7	6	4

Table 4 - Distribution of backyard sizes in the recent examples from outer suburbs

	Springfield Lakes QLD	Meadow Heights VIC	Mount Druitt NSW Rooty Hill	Mount Druitt NSW Meacher St	Blakeview SA	Smithfield Plains SA	Spearwood WA
m²	%	%	%	%	%	%	%
0-49	18	14	30	29	25	25	50
50-99	39	32	48	58	17	45	47
100-149	21	43	16	6	26	15	3
150-199	13	7	6	3	24	8	0
200-249	4	4	0	0	7	3	0
250-299	2	0	0	3	0	5	0
300-349	2	0	0	0	0	0	0

Figure 1 - An aerial view of part of the Brisbane suburb of Camp Hill QLD subdivided 1945-1947. The houses are generally of the “Queenslander” type. Note the number of large trees.

Figure 2 - A typical backyard in Camp Hill QLD.

Figure 3 - An aerial view of part of the suburb of Hebersham, subdivided in the 1980s in western Sydney NSW.

Figure 4 - An aerial view of part of the Perth suburb of Spearwood WA. Subdivided in the 1980s.

Figure 5 - The issue of lot coverage by the gap around the house. With a 2 m gap, for a 300 m^2 lot area, 10 x 30 m, site coverage is 52%, for 15 x 20 m it is 59%, for a 600 m^2 lot area, 15 x 40 m, site coverage is 66%. This narrow gap alone can take up 34-48% of the lot.

Figure 6 - An aerial view of a cul-de-sac off Meacher Street, Mount Druitt NSW, subdivided in the late 1990s.

Figure 7 - The street scene in a cul-de-sac off Meacher Street, Mount Druitt NSW. Note the dominance of the garage doors.

Figure 8 - An aerial view of part of the Perth suburb of Spearwood WA, constructed in the 2000s. It is on the opposite side of the main road from the example shown on Figure 4

Figure 9 - Street scene in part of the Perth suburb of Spearwood WA from the 2000s. Note the dominance of large paved areas and wide garage doors.

Figure 10 - An aerial view of part of Springfield Lakes QLD completed in 2002.

Figure 11 - The side and rear of a dwelling in Springfield Lakes QLD. Note the smallness of the backyard and meagre provision of windows. Not also the unsightly townscape and unusable grassed area.

Figure 12 - A typical house from 2006 within the master-planned estate at Ascot Waters WA. Note the large size of the house and the lack of space around it.