The sustainable urban territory, towards an environmental urbanism

The role of green spaces and parks in ameliorating the effects of the modern city are well recognized, and not just confined to our present concerns in developing a low carbon city. The 19th century park movement was created primarily to alleviate the appalling urban conditions of the new industrial city. The extraordinary success of the new park movement was seen firstly in the Northern English industrial cities, three major parks, Peel Park, Queens Park and Philips Park were built or initiated in 1846 in Manchester alone (Mosser, Monique. Teyssot, Georges. (1991)- The park movement rapidly spread around the world, the work of F.L. Olmsted, is the best-known American exponent; Central Park, Prospect Park, the Buffalo Park system, the Emerald necklace, and so on (Olmsted, Frederick Law. (1997). The park, built in the middle of the new city was seen as vital for the heath and education of its citizens.
While the park as a type underwent many evolutions, from genteel recreation ground for the middle class to a multi functional park for the workers recreation, the strict spatial separation of city, that is streets and building, and green space, remained inviolate (ref).

New Urbanism
This particular urban typology was rediscovered in the late 20th century by the New Urbanist movement (Leccese, Michael.(2000). New Urbanism offered a renewed interest in the idea of community and how it could be developed through a particular urban type - the traditional European and 18th, and 19th century American town. The characteristics of this particular morphology include a gridded city layout and a clearly defined hierarchy of both public buildings and public spaces. Allied to this typological model was the original principals of New Urbanism; walkability, connectivity, mixed use and diversity, mixed housing, quality architecture and urban design, traditional neighbourhood structure, increased density, smart transportation, and sustainability (Leccese, Michael.(2000).
However the critical role that the park played in the development of the modern city has been subdued. A quick glance at the New Urbanist principles and a study of the innumerable new urbanist projects would confirm the secondary role played by the landscape (that is parks or gardens). In these New Urbanist projects, the landscape is chiefly confined to street planting or public space, the design heavily influenced by a suburban picturesque (Leccese, Michael.(2000).
Recent New Urbanist research work has resulted in the expansion of the ordinal New Urbanist remit to include not the neighbourhood or town but also the region. Smart Growth, the brand name for this study uses the transect, a devise borrowed from Patrick Geddies regionalist studies (Geddes, Patrick (1915). New Urbanist has developed a methodology for placing the original urban design research and work within a regional framework. Starting with ‘nature’, the transect moves through the agrarian and suburban to the core of the city. While the transect confirms the traditional development of the European city, it also validates the traditional dichotomy of nature vs. city.

The transect concept had been manifested in the development of a new planning regime, the Smart Code (Smart Code Central). A cursory examination of the codes relationship of public space to the city is revealed in table 13 which categories a typology of civic space within the transect. As we move from nature to city centre so we move from park to plaza. The park is defined as, ‘ a natural presence available for constructive recreation. A park may be independent of surrounding building’ (Smart Code Central) the location of the park within the transect is confined to three zones; nature, rural and suburban. (The relegation of the park to the periphery of the city will perhaps come as something of a surprise to the users of Central Park in Manhattan perhaps one of the most intense urban place in the world).

This isn't to say that New Urbanists don't recognise the importance of the serious environmental challenges that the building of new cities entail. In a recent pronouncement the Congress for the New Urbanism announced a policy for the amelioration of climate change through urban design (Climate @CNU Low carbon neighbourhoods, high quality living). This strategy reframes one of the original new urbanist principles, the walkable neighbourhood. By building denser cities, the closer work is to the housing, the better the public transport, the lest need to cars and consequently the least carbon emissions. So the challenge of the low carbon city is met by a reduction in the volume of car trips, however the potential of the landscape, is as yet, unexplored.

The Garden City

In contrast to this traditional narrative of urban development in the 20th and twenty first century, where a strict apartheid was maintained between city and the landscape, another version of urban development started to develop in England at the end of the 19th century. Here the landscape is seen as a vital component in the building of a new city for the twentieth century. This idea tested then rearranged the strict division of architecture and landscape in a series of increasing fascinating experiments. The progenitor of this mix of landscape and urbanism is the Garden City, a movement that began with the publication of Ebenezer Howard's book, Garden Cities of To-Morrow (Howard, E. (1944). In this publication, Howard advocated a new form of urbanism, one that finds a middle way between the new industrial city and the old agrarian landscape. This new city is described in a diagram; a set of concentric circles, alternating built zones and landscape zones. These circles radiated from a central circular space containing five and a half acres of 'beautiful and well-watered garden surrounded by public buildings each standing in their own ample grounds" (Howard, E. (1944). Encircling these public buildings was the landscape ring of Central Park, 'an area of 145 acres, planned to accommodate ample recreation grounds within very easy access of all the people" (Howard, E. (1944). A Crystal Palace, a wide glass arcade, with shops and permanent exhibition space, in turn encircled this. Its circular form, Howard wrote 'brought it near to every dweller in the town, the furtherest removed inhabitant being within 600 yards" (Howard, E. (1944).

Howard's diagram continued these concentric rings outward to accommodate residential housing, each which stood in their own ample ground (with) "varied architecture and design some having common gardens and co- operative kitchens" (ref). These were to be ringed by the verdant backdrop of Grand Avenue, which divided the city into two belts. Within this avenue Howard located the cities schools and churches. The Grand Avenue was bounded by two further rings of residential housing which in turn were encircled by an industrial ring containing; factories, warehouses, dairies, markets, coal yards, and timber yards which fronted the circle railway. The sidings of this railway line connected it with a main railway line, which passed through the estate, and radial thoroughfares bisected the concentric rings. Finally a green belt of agriculture and forestry surrounded the whole town interspersed with institutions, which included, "farms for epileptics, asylums for blind and deaf and convalescent homes" (Howard, E. (1944). The lack of a clear plan for the new city was matched by the lack of any description or design as to what the 'garden' of the garden city might be. However this reluctance to prescribe specific design detail or to foresee every contingency is perversely the very strength of the project. The generality, abstraction and emptiness of city and landscape design at the heart of this Ur text, has allowed a versatility and freedom of movement for the urbanist in the 20th and 21st century. Howard strips the 19th century notion of the garden and park of all its associated meaning, leaving it open to what it could become. Elided of any stylistic or ideological value, the landscape is free to assume any form or configuration within a floating relationship with the both the domestic and the civic.

Letchworth in Hertfordshire was the first town to demonstrate the principles of Howard's book. Designed for 30,000 inhabitants by the architectural partnership of Barry Parker and Raymond Unwin in 1903 they following Howard's book to the extent of clearly separating the town from the surrounding countryside. Parker and Unwin set aside 1250 acres for the new city and 2,800 acres for an Agricultural Belt that would act as a permanent 'girdle' to the town. The structure of the town became defined by the existing transport network, the Cambridge railway line running west to east and by Norton Way, a major road which runs north /south joining the village of Norton with the Great North Road. The railway and road divided the town into four areas with different zoning characteristics, to the north west, Norton Common, to the north east, workman cottages, football grounds and allotments; the south east, factories and sidings and workman's cottages, and to the north west, the town centre, the station and housing

The place of the landscape in this new town contrasted to both diagrammatic possibility of the garden city diagram and the functionalist zoning distribution of the Letchworth's urban structure. Four landscape types were developed; the individual garden around the house, the street landscape, the common or wild landscape, (in the form of Norton Common) and the agricultural landscape of the town belt. These four landscapes segue into each other partly as a result of the town new legislation where house and garden design are prescribed Purdon, C. (1913)

In the Garden Cities of To-Morrow, the garden is simply a diagram with all of the openness and freedom that such a diagram affords. Letchworth demonstrates one of the possibilities of this potent diagram, the private residential garden, the planted public street, and the nature/reserve. All are linked with an emollient blanket of planting. Ironically the first actualised possibility of Howard's diagram proved the most durable pervasive and finally the most conformist model becoming the dominant landscape configuration for the design of the 20th and 21st century suburb.

'Then suddenly we find ourselves at the feet of the first skyscrapers. But here we have, not the meagre shaft of sunlight, which so faintly illuminates the dismal street of New York, but an immensity of space. The whole city is a park. The terraces stretch out over lawns and into groves…. Here is the CITY with its crowds living in peace and pure air, where noise is smothered under the foliage of green trees… Here bathed in light stands the modern city" (Le Corbusier. (1987).

This quote, taken from Le Corbusier, demonstrates the idea that landscape and city could develop a new relationship different from the traditional city/park divide. Le Corbusier's plan for the modern city was based on a super sized grid laid over a level site, surrounded by a protected zone of woodland and fields. The centre of this gridded city was a multilevel transport interchange, surrounded by a large park supporting twenty-four, sixty-storied towers in grid point pattern. Surrounding this central area was a perimeter of housing blocks of two types; a traditional perimeter block with a large courtyard/garden/recreation area in the centre and a more open linear type block with large return or redent along the perimeter. A green belt or fresh air reserve" (ref) encircled this configuration.

1. We must de-congest the centres of our cities
2. We must augment their density
3. We must increase the means for getting about
4. We must increase parks and open spaces.' (Le Corbusier. (1987)

This description gives Corbs project a diagrammatic quality to the new city but this is belied by the detailed, almost lyrically description of the landscape and the evocative drawings. Other influences range from the new American cities of the 1920s; the skyscraper, the motorway and central station, Beaux Arts planning, the Roman decamanus and cardo, the triumphal arch, and the planning of 19th century English Parks. Similarities with Howard's diagram are also obvious; the Central Park with the public building embedded within it, the perimeter of residential housing and the surrounding green belt. However other qualities clearly differentiate the Corbusier

project from Howard's, in particular Le Corbusier's carefully considered treatment of the landscape in relation to the various architectural forms. To accommodate the apartment dwellers desire for a private garden in their three and four storied 'redent' housing blocks, the sides of the buildings are opened like a Swiss cheese and planted as gardens. These gardens are 'paved with red tiles, its walls are hung with ivy and clematis; laurels and other shrubs cluster thickly in large cement pots;" (Le Corbusier. (1987). Collective garden areas wrap around the foot of the building and are laid out in a combination of sports fields and kitchen gardens. The Central Park landscape by comparison is composed as a traditional English picturesque scene complete with grass and large specimen trees. Located within a strong axial grid the office towers are never the less freed from this plan by the park landscape. From a distance these immensely tall, glass sheathed office towers appear to float in a sea of greenery, effectively dislocated from their empirical grid. The landscape of the 'Redent' housing blocks produces a similar effect, as the gardens seems to erode the perimeter of the blocks fusing garden and street landscape.

One of the most famous images of Le Corbusier's city, the view of the towers in the park from the surrounding terrace, would assume a life of its own becoming an icon for the modern city, the tower in the park.

An example of the way the French modernist paper project transformed into a built world is the Alton West estate on Roehampton Hill overlooking Richmond Park – the tower block transposed to the English countryside. Designed by the Architects Department of London County Council, this mixed housing estate was built between1952-58 (Harwood, Elain and Powers, Alan. ed. (2008). Located on a 130-acre site on the southern side of Roehampton, this housing estate is made up of point blocks, slab blocks, maisonette blocks, terraces and houses. Bounded by roads on three sides and a park on the other, the site was and still remains, occupied by large C18th and C19th houses and gardens. As a consequence of this, the housing estate not only overlooks a park but also exists within a series of historic gardens.

While Le Corbusier's City is a conglomerate of basic landscape typologies, the individual garden, the communal garden with allotments, the sport fields, the English picturesque garden and the park; all remain essentially unchanged (although they are reordered in conjunction with a radically reconfigured architecture).

However the new reading of Corbs sketch at Roehampton as a tower in nature lead to a fundamental reordering of the garden in the modernist period, a disappearance of the private garden, to be replaced by the communal public garden.

These two urban models, the individual house and garden in the suburb and the tower block in the park have represented the two dominant types of domestic urbanism for much of the twentieth century. The landscape whether garden or park has been a critical and equal participant in the development of a new kind of urbanism in which the landscape acted as deliberate mechanism to increase a quality of urban life, and help human health and well being.

The urban forest

This rich thinking about the role of the landscape in the city continued through out the twentieth century with the many other urban experiments; Rayburn, Onkel Toms Hutte, Harlow to name a few. In the late twentieth century, scientific research has shown the effect of green space and especially trees, in encouraging biodiversity, moderating the effect of heat islands and sequesting carbon in the modern city (ref). As we are all now aware the building and functioning of the contemporary city contributes to both low-level atmospheric pollution and broader climate change through the production of greenhouse gases such as carbon dioxide. High levels of carbon dioxide (CO_2) and other gases produced by a number of industrial and agricultural processes trap heat from the Earth by forming an impervious layer in the atmosphere This process is known by the popular title the "greenhouse effect'. It is known that trees remove

(sequester) CO2 from the atmosphere during photosynthesis and return oxygen back to the atmosphere as a by-product. We can therefore use the growth of trees to act as a carbon sink and an oxygen source. Collecting trees in a park can help sequester carbon on a large scale in the city. Increasing the number of parks helps reduce atmospheric pollution, and contributes to the lowering of greenhouse gases in the city.

Towards a new technique

The challenge of developing a city that reduces the amount of carbon it consumed through the development of open space and landscape necessitates an attempt to find a process or a strategy which can open up the existing structures of the contemporary city and landscape, break open their tightly constructed organizations and both contest and construct a new way of thinking about and building a new landscape and city.

The first step in this project is to establish a kind of connective strategy between the two practices by effecting equivalence between the landscape and an urban regime, to make a possible segue. This equivalence can be affected by thinking of the landscape and the city as conditional states rather than types or styles. These states are limited. Their boundaries give simultaneously an interior and exterior. The bounded state is given a name, a territorial assemblage (Deleuze, Giles. Guttari, Felix (1987) something that is both traditional, a territory, based on social and cultural mores and assembly of constituent parts. Concurrent with the drawing of the boundary is the possibility of opening. This openness is porous, flowing both inwards and outwards as conditional states advance and retreat change and adapt to form new assemblages.

Landscape and urban practice have their own integrity yet each is open to the other through shared conditions. Some of the conditions of the landscape are horticulture, topography, and hydrology. Some of the conditions of urban practice, are prescriptive guidelines; requirements for the roading and drainage networks.

A project that sought some sort of conditional equivalence needs to be represented in some manner. The following case studies, which explore the possible implication of this position use a GIS (Geographical Information Systems) programme, ArcView, as a descriptive design technology that can describe how landscape and urban practices can connect (Batty, Michael. Goodchild, Michael F. Maguire, D. J. (David J.) (2005) .

Traditionally used in landscape practice as a mapping and analytical tool, ArcView builds a series of maps showing site conditions such as; aspect, slope analysis, contour and conjected condition, like the position of overland flow paths. The maps generated by the programme can be displayed as plans or as models. ArcView is also able to manipulate the resultant maps in certain ways to obtain analysis and insight into certain site condition. Maps can be combined into a variety of combinations; privileging certain data over another or combining data in certain ways. Data can be bought into contact with each other and set up complex boundary and border relationships.

One important technique is mapping and reclassification. While these tools are traditionally used to record and describe site data, they can be used to recombine data to make compatibility maps; for example aspect, slope, and water flows can be used to locate site zones in which certain plant growth conditions could be met. These conditions can be graded from high probability of growth to low growth probability. This faculty can extend from functional criteria to more conceptual intentions. Another valuable function is buffering, where certain conditions are bought alongside each other. A buffer can describe the potential for these conditions to act on each other or intermediate zone, which shares qualities of the adjoining conditions. The buffer is theoretically infinitely subdividable into more and more crossovers and inter-penetrations. Because ArcView works at a regional scale and naturally encompasses the bigger scaled site, its standard landscape diagnostic tools automatically generate a richer and denser field of

information. In addition, Arcview's data driven mapping and analysis models help to delay traditional design concerns; such as meaning or typology or style, which often surround the design of city and landscape.

Developing a urban design process that is driven by an acknowledgement of landscape conditions creates an automatic opening for other data such as rates of carbon sequestration through tree panting and the creation of green space, these effects can both be modelled using GIS functions over a period of time.

Two design case studies are presented to explore some of the theoretical and technical questions that have been raised in this discussion.

Case Study One

This project was generated by an innovative housing competition, an exploration of how gardens and architecture can be generated out of a landscape process in which site conditions and the horticultural particularities of subtropical crop production intersect to produce a site planning strategy.

The brief called for forty-eight units of mixed pensioner and family accommodation and specific reference was made to the recently published innovative guidelines for Pacific Island housing. Situated in a shallow valley, surrounded by two ridges, which run down to the main street of Ellerslie, the site lies near the end of one of the ridges, facing south. Roads bound the site to the west and south and a car park on the southwest corner. Suburban housing surrounds the rest of the site.

This project was generated out of a consideration of existing landscape forces, site conditions and garden practices of Pacific Island peoples living in Auckland. The project concentrates on the particular and unique horticultural practices that Pacific Islanders have developed in Auckland including the introduction of indigenous and exotic crops from tropical habitats. Auckland's subtropical climate, high rainfalls and humidity have modified the choice and cultivation of these crops. The main crops cultivated in Auckland by the Pacific Island community are; banana, taro, citrus, and pele.

GIS maps were generated to include: existing site conditions such aspect, contour, slope, and conjectured conditions such as overland flow paths. A set of site diagrams was developed that used the site conditions to find the best areas on the site for the production of particular species.

The first step was to develop a site condition matrix that combined and reclassified the site to develop a zoning diagram to indicate a scale of site attractiveness to particular plant species. This operation revealed the sites, which offered the best growing conditions for the most plants, to the sites least attractive for crop cultivation. The site was graduated into five zones; the best three were selected for intensive crop cultivation. The specific site conditions determined what exact crops to grow. The least horticultural attractive zones were then identified as building sites. The map was reclassified into two zones a cultivation zone and a building zone. Two major overland flow paths split the proposed building zone.

The result was two maps; the first a horticultural diagram full of intensities, a swirling map of potentials with specific horticultural zones responding to particular site conditions. The other map was an undifferentiated and silent outline with the potential to become activated through adjacencies to both local horticultural conditions and more general site conditions. The shape of the footprint was a loosely connected series of forms running roughly north south. Similar, though smaller forms to the west roughly parallel this figure. The architectural possibilities contained within this diagram were further explored in a series of studies; the building footprint was simply extruded into a two-storied structure to give the required building volume.

The smaller buildings to the east were identified as being suitable for pensioner housing while the bigger blocks to the east of the site were identified as being more useful for family housing. The layout indicated that the development could be accessed from both the west and east

leaving a large, undisturbed communal space between the blocks. Buildings would be connected by a major roof structure, which mimics the existing ground contours, stormwater runoff from this roof structure would be allowed to fall into existing flow paths.
The result was an unmodified topography, heavily occupied by an intensely busy ground plane of crops and two urban streams. The housing is constructed as a single structure made up of simple modular units, which open directly to the gardens and streams. The integration of natural site conditions and garden conditions produces a garden of useful, edible horticulture. The architecture that emerges from the process is connected to a wide range of landscapes from a vigorous and intensive garden culture to the larger landscape concerns of rainwater collection and overland flow paths.
The result indicates the rich potentialities of garden and city, bought into unexpected yet fruitful coexistence.

Case study two
The second case design case study explores how GIS could be used to develop an urban configuration that increases the density of the city while at the same time increased the potential for major tree planting and thus carbon sequestration.
The site is a housing study for an area near Manukau City in South Auckland New Zealand. Manukau City was formed by the amalgamation of Manukau County and Manurewa Borough in 1965. It has a population of 362,000 people, the third largest in New Zealand. The City is located south of the Otahuhu isthmus, the narrowest point between the Waitamata and Manukau Harbours. The urban patterns of Manukau City are typical post war suburban sprawl, generated by the construction of a new major motorway system. Manukau City itself is a loose grid of low-rise office towers and a mall, a typical modernist 1960s city centre. To the east, a major motorway, State Highway One, to the north, a light industrial suburb, to the west, Haymans Park, defines the city boundaries and low scale suburban houses define the southern boundary.
The genesis of this project was the proposed and now real, construction of State Highway 20, a ring road that connects Manukau and State Highway One with West Auckland. A laudable objective and one that will see a supposed decrease in traffic in the inner city, however the position of the new highway will sever Manukau City from the southern suburban neighbourhood, replacing this with a six-lane motorway.
This design project looks at the impact of the State Highway 20 on the urban edge of Manukau City. We decided to focus the study on a two-hectare site, an area between the existing Puhanui stream to the south and the new motorway in the north. Originally the site was a piece of left over ground visually connected to the state housing (government funded and run housing) to the south and Haymans Park and Manukau City to the north.
The research proposition was to develop an extension to the public housing on the southern side of the city, maintain and strengthen connections to the city and park, and provide public space. On a wider level, the project was about developing a new model of housing that avoided the standard suburban model; provide a denser housing framework, while ensuring a good ratio of green space.
Using GIS analysis, all the landscape conditions of the site, streams, overland flo paths, and contours were examined. The massive disruption both to the ecological systems and the urban networks that the construction of the new highway will cause was also modelled.
The first step, the privileging of hydrological system takes the existing overland flow paths and stream system and buffers them with indigenous riparian planting. The overland flow path is collected in wetlands before being discharge into the local stream system. The run off from the new motorway, instead of being collected in a large stormwater pond, is fed into the flow path system.

Provision of sport areas is accomplished with the use of aspect/slope analysis to determine what areas of the site are flat. This analysis, plus the establishment of path network through the site helps link the stream and city to the housing establishment. Housing footprints are simply established in the left over spaces.
The resulting housing configuration is four, roughly rectangular blocks running west to east. The blocks all-open to private space to the north (the sunny side in the southern hemisphere) while the north/south streams of the overland flo paths and accompanying planting bisect them.
The resulting urban diagram shows a new kind of urban configuration that has the possibility of escaping the high green space but low density of suburbia while avoiding the equally problematic high density but low green space model advocated by New Urbanists.
The challenge for the future city is how can we best expand and enhance our urban green space as an integral part of the low carbon cities? Understanding the scientific use of trees in helping reduce carbon in the city is part of a complex balancing act in reducing our carbon infrastructure. Developing a new design technique that starts by understanding and foregrounding the landscape conditions of the new city will help the designer to understand the landscape can help in the process of carbon sequestration and at the same time discover new kinds of public space.

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