ENVIRONMENT DESIGN GUIDE

PERMACULTURE

PART A – INTRODUCTION AND URBAN FARMING
PART B – PRINCIPLES AND APPLICATION

Jenny Donovan and Peter Cuming

Summary of

Actions Towards Sustainable Outcomes

Environmental Issues/Principal Impacts

- Current practices for design and operation of the built environment lead to inefficient and wasteful use of energy and resources. Urban areas often don't allow people to efficiently or equitably meet their needs. This makes it difficult to produce and access local foods and materials and share resources, for example.
- Urban areas rely on a 'hinterland' much larger than their own area to provide the resources that support the levels of consumption they promote, a concept described as a town's or city's 'ecological footprint'. With increased globalisation an urban area's ecological footprint can literally extend across the globe, consuming several times more than the planet is capable of sustainably providing, and as expectations and populations rise these impacts are growing.
- Permaculture is about establishing conditions that enable people to meet their needs through more harmonious integration and utilisation of the natural world with their built and social environments.

Basic Strategies

In many design situations, boundaries and constraints limit the application of cutting EDGe actions. In these circumstances, designers should at least consider the following:

- Observe how natural processes affect a site and its surroundings, and design effective solutions that utilise these, rather than simply applying conventional solutions.
- When designing urban spaces think about the links between each space and how they can meet people's needs, and support the wider biological community upon which we depend. If a design doesn't add benefit then the design may not provide the best use of the land.
- Think about the health, social, aesthetic and resilience benefits of urban farming. This can increase the capacity of urban areas to meet people's needs, add interest, provide a focus for community and personal development, and reduce the dependence and impact of areas further afield.
- Ensuring that natural opportunities such as access to cooling breezes and solar warming are utilised rather than relying on artificial means. Similarly catch and use water onsite a number of times before releasing it.

Cutting EDGe Strategies

- Facilitate development that produces little or no waste through using cyclical systems rather than lineal systems, where the output of one system could become the input of another.
- Replicate natural processes in designs so that spaces exhibit self regulating mechanisms and require minimal intervention.
- Encourage productive places where vertical and horizontal edges, overlaps, margins, and gateways create opportunities in time and space for greater yields in terms of edible and enjoyable landscapes.
- Design for both natural and human needs and be aware of how these link to adjacent places so that the designed elements function as part of a whole. Supporting these beneficial relationships and traditions can bring responsive evolution and a sense of belonging.

Synergies and References

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- Mollison, B, 1991, Introduction to Permaculture, Tagari, Tyalgum, NSW.
- *Environment Design Guide*
  - GEN 3: Biodiversity and the Built Environment
  - GEN 39: Ecosystem Services for Regional Sustainability

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PERMACULTURE

PART A – INTRODUCTION AND URBAN FARMING

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This paper is the first of a two part paper intended to introduce the concept of permaculture and urban farming to built environment professionals. These papers seek to challenge the perception that permaculture principles are just for the 'veggie patch' and draw attention to their potential to be used to design places that are better equipped to meet people's needs, now and in the future. This paper discusses the philosophical basis of permaculture and urban farming. The second paper entitled: Part B – Principles and Application*, discusses the principles of permaculture and provides a few indicative examples of its potential application in urban environments. It is not intended to document the range of applications of permaculture or their respective technical merit, rather it is intended to provoke interest and invite professionals new to this philosophy to explore this matter further.*

This paper was originally published in August 1996 as GEN 9: An Introduction to Permaculture and Urban Farming*. It was revised by Peter Cuming in May 2002, and has been substantially expanded and revised by the co-authors to its current form.*

Keywords:
permaculture, resource efficiency, urban agriculture, urban farming, urban design, wild energies, care for the earth

1.0 INTRODUCTION

Our world is one of increasing competition for scarce resources. As both population and demand grow, so does the pressure on the environment to provide the basis for social and economic development. The design of towns and cities influences the opportunities available to people who share that environment. This in turn influences people's ability to access the qualities and experiences of their environs they depend on to meet their needs, to thrive and fulfil their potential. In other words cities are an allocative mechanism (Harvey, 1988), where some people can access a much wider range of experiences that support their well being and chances of personal development than others. This means that some are disadvantaged simply because of where they live. The Victorian study *Place Does Matter for your Health: Victorian Lifestyle and Neighbourhood Environment Study*, (Kavanagh et al., 2007) summarises a range of investigations and found the following as key issues for city inhabitants:

- residents living in more disadvantaged areas have poorer health and are less likely to participate in physical activity and healthy eating
- residents living in more disadvantaged areas are also more likely to purchase fast food for consumption at home
- barriers which prevent people from exercising are more frequent in areas of low socio-economic status

Furthermore, built form is one of the most significant influences on patterns of consumption (Newman and Kenworthy, 1999). The way cities are designed can be seen as influencing not just the amount of resources cities consume but also how the benefits and costs of that consumption are distributed amongst the people that share those cities. This paper explores permaculture and urban farming as two related strands of thought that may be useful in addressing this waste and inequity.

Figure 1 The Ecological Footprint

(Source: Wackernagel, 1993)

2.0 PERMACULTURE

2.1 Definition

In essence, permaculture seeks to consciously design places to reflect the interactions between elements found in nature to create the optimum circumstances to support human well being, creating as it were human habitat. The term permaculture is derived from a shortened form of permanent agriculture and was first defined and explained by Bill Mollison and David Holmgren in 1974. The concept was further developed in Bill Mollison's books, *Permaculture: a Designer's Manual* (1988) and *Introduction to Permaculture*. Mollison (1991) defines permaculture as "the conscious design of agriculturally productive ecosystems which have the diversity, stability and resilience of natural ecosystems. It is the harmonious integration of

landscape and people providing the food, energy and shelter and other material and non material needs in a sustainable way".

2.2 Built Environment

The principles of permaculture (as outlined below) can help inform the design of the built environment to enable the people who share that environment to respond effectively to emerging challenges including peak oil and climate change. By changing the emphasis of architecture and planning to better reflect natural processes and connections rather than to depend on wasteful and resource intensive systems, designers can promote environments that facilitate people to meet their needs with a reduced dependence on appropriating environmental resources from elsewhere, or from future generations.

Most cities import food, materials and energy from their surroundings, and increasingly from much further afield, and cities also export their waste to other places (Birkeland and Schooneveldt, 2003). This requires extensive infrastructure and large inputs of resources and energy to move things around, process them and deal with the waste produced. A permaculture city would seek to meet its inhabitants' needs in a much more efficient and resourceful way. It would do this by minimising the need for those people to invest time and resources in meeting their needs elsewhere, and minimising the environmental costs of accessing distant resources. A key expression of this approach would be to design cities that reconcile producing a diverse range of locally produced tasty, filling and nutritious foods and materials accessible to all, alongside the other traditional objectives of urban design (i.e. creating places that feel safe, inspire and welcome people, offer opportunities to forge the bonds of community, and find employment and education).

2.3 Urban Farming

Half the world's population now live in cities (UNESA, 2007). Urban farming is about weaving the potential to produce food into the built environment, capitalising on the core characteristics available to the town or city in question; the proximity to labour needed to grow food and people who will consume it. Urban farming can take many forms; productive rear and front yards are probably the most common form, community gardens and street trees (chosen to produce an edible fruit, nut or seed) are probably the highest profile, being in the public realm. Other forms of urban farming include apiaries, keeping of fowl for meat and eggs, planting of green roofs, vertical and rooftop gardens, skyscraper farms, and vermiculture (worm farming) or other composting to recycle organic waste, creating soil and nutrients for maintaining food production.

Urban farming contributes to the sustainability of a city in a number of economic, social and environmental ways:

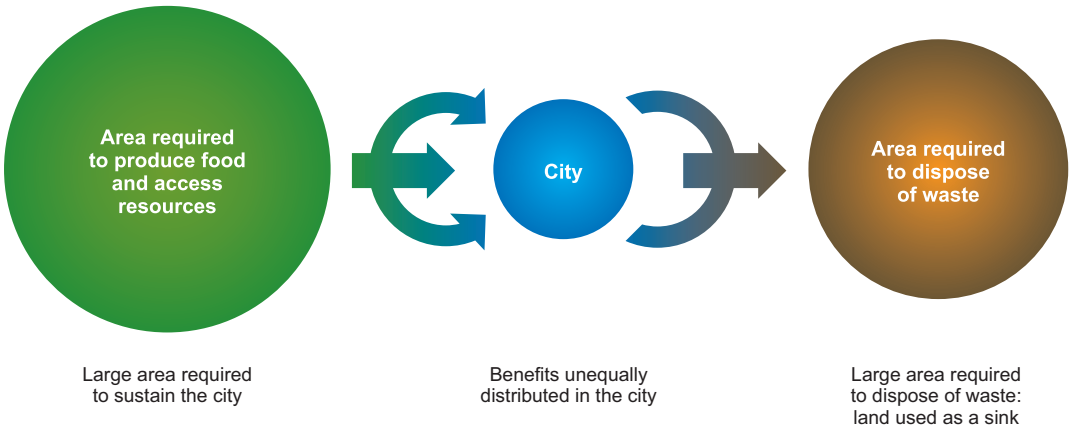
- it increases food security for people who are typically removed from the production of food
- it facilitates waste recycling which allows for fertiliser and soil nutrients to be accessed locally
- it reduces food transportation costs and impacts including pollution and greenhouses gases
- it is labour intensive and value-adding thereby creating a range of employment opportunities
- it provides green space in cities and adds to the biodiversity of the surrounding region.

An American study found that every $1 invested in urban farming yields $6 worth of vegetables and that those who participated in urban farming also enjoyed benefits to their nutrition, physical health through exercise and mental health through community engagement (CFSC, 2009). A Canadian study (Urban Agriculture Network Australia, 2007) also found that micro farms on only eight per cent of Toronto's rooftops could achieve the following benefits:

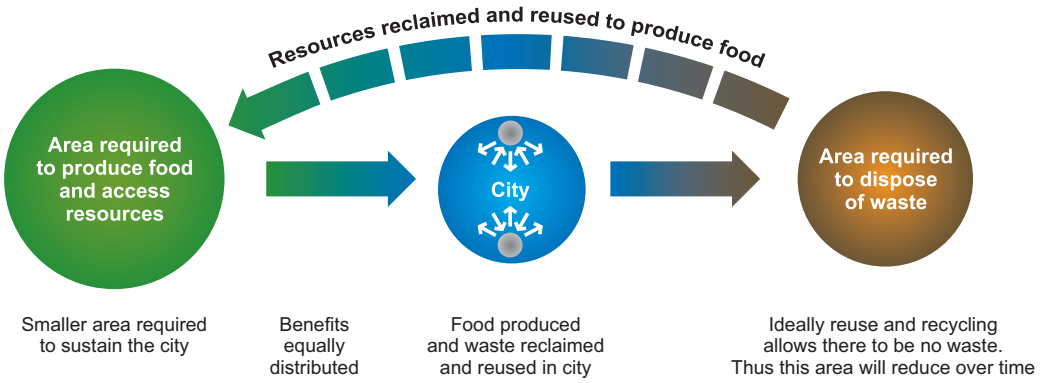
- reduce the city's heat island effect by up to 2° C
- direct saving of C$12million per year for buildings owners and occupants due to reduced cooling demands in summer
- reduce levels of carbon dioxide, ozone and dust, particularly the dust particles that cause health problems, reduce sulphur dioxide as a result of the reduction in the heat island effect, and also the trapping of gasses and particulates by plants grown on green roofs
- reduce stormwater flows by 12 million cubic litres a year, reducing the strain on infrastructure
- deliver cost savings of C$79 million a year from reduced capital costs for stormwater management, erosion control, and sewer overflows

By giving landscape qualities and enhanced social values to what is often abandoned or under-utilised areas of open space, and by providing a focus around which the bonds of community can coalesce, urban farming has the potential to provide the settings to meet other needs, such as educational and aesthetic, as well as contribute to the recycling of the organic waste generated by urban areas.

A key example of this is the urban farming movement from the UK (Federation of City Farms and Community Gardens, undated). City farms provides a model for turning around degraded abandoned land known as 'brownfield' sites, which contribute little to the surrounding community. The conversion of such sites to city farms makes them productive places that contribute to the wider community by providing what is often better access to fresh food, social, recreational and educational resources, to say nothing of their improved aesthetic value.



Existing situation



Situation Improved with Permaculture

Figure 2: Comparison of simplified models of the relationship between a city and its hinterland

(Source: models by Jenny Donovan)

Urban Farming can also play an important role in equipping communities to be more resilient to external factors such as a sudden decrease in the availability of resources. An example of this is the experience in Cuba following the collapse of the Soviet Union in a period known locally as the 'special period'. From 1989 onwards a multi-nation blockade brought food and energy imports to Cuba from the outside world to a virtual halt. During this time urban farming made a significant contribution to meeting the food needs of the urban population, providing 36 per cent of the fruit and vegetables produced nationally (De la Salle, 2004). This was at a time when "the nutrition and health of the Cuban population have shown dramatic improvements in the last three decades" (UNFAO, undated) and Cuba is the only country in the world to meet the United Nations' targets for sustainable development. This provides a salient lesson in the capacity to utilise urban environments to improve quality of life, develop resilience and provide an effective buffer in the long term to the changing fortunes of the outside world.

3.0 THE IMPORTANCE OF PERMACULTURE AND URBAN FARMING

Urban areas rely on a hinterland much larger than their own area to provide the resources that support the levels of consumption they promote. This concept has been described as the town or city's ecological footprint by the renowned sustainability advocate Mathias Wackernagel. For a given community this is the "amount of land needed to biologically produce the resources they consume and to assimilate their waste indefinitely" (Wackernagel, 1993).

As Wackernagel points out, based on his work in Vancouver, Canada, the ecological footprint of that city is 80 times the area of the size of the city. As rates of consumption and populations rise these ecological footprints are growing, making the competition for resources more intense and marginalising those in society who cannot compete for these resources. Through the advent of constant global trade a city's ecological impact is now recognised to include, and impact on areas and places far beyond its relative bio-

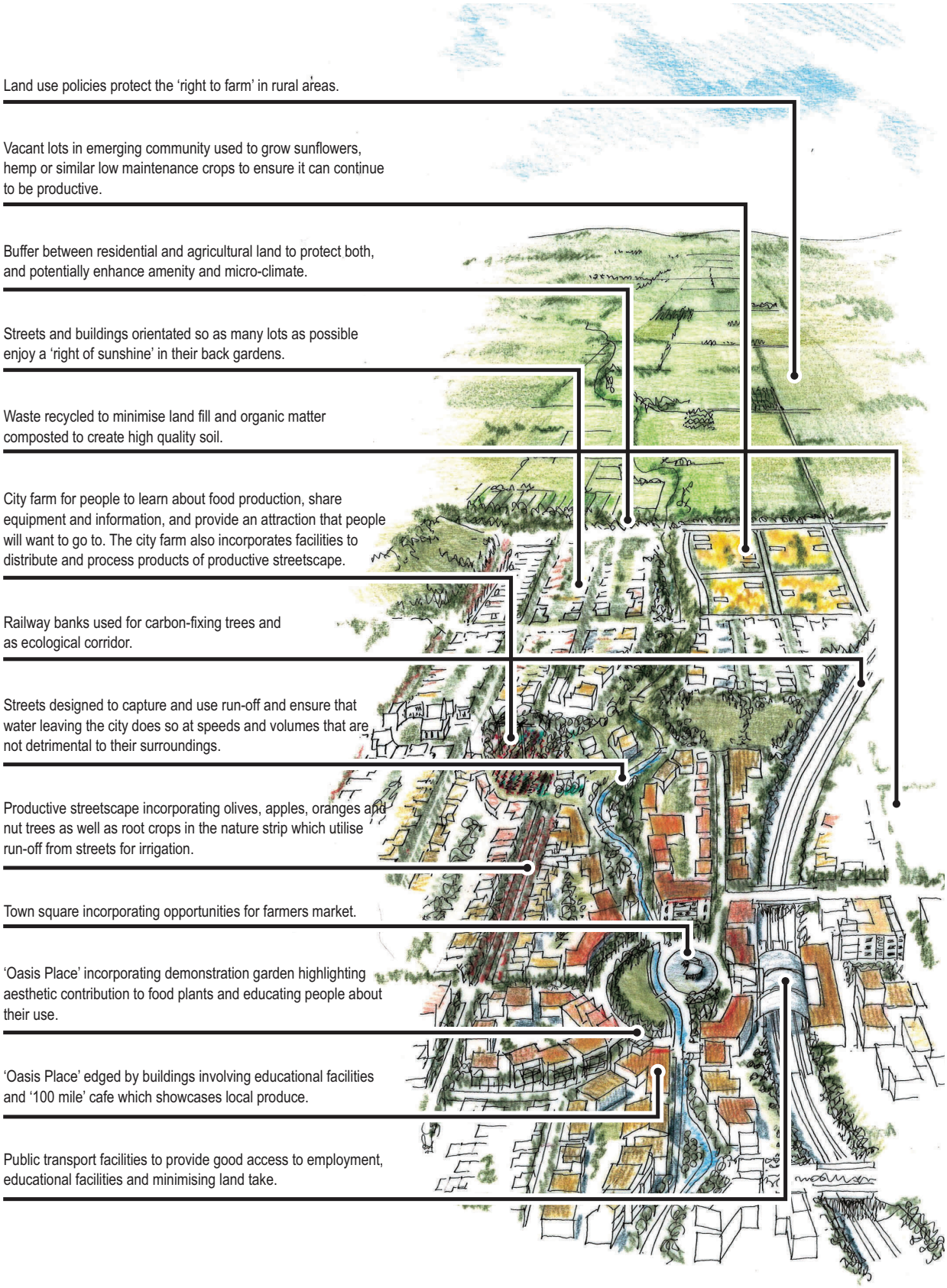


Figure 3: A model of a food secure town

(Source: Jenny Donovan, 2009)

region (or natural and social catchment).

Urban areas are also typically the focus of cultural identity, education, creativity and community services. The effectiveness and reach of these urban areas to provide the optimal conditions for people to express themselves, receive and provide care, grow and fulfil their potential within nurturing communities might be seen as its cultural footprint. A place with a large cultural footprint has a strong ability to inspire, raise awareness and provide opportunities among the people in its hinterland. Consequently whilst it is desirable to reduce a city's ecological footprint it is desirable to increase its cultural footprint.

Permaculture seeks to minimise our ecological footprint, and urban farming provides us with a means of doing so whilst also increasing our cultural footprint. Australia is one of the most intensely suburbanised countries in the world (UNESA, 2007). Towns, cities and suburbia are the familiar territory for most Australians and it follows that equipping these environments to better support people's well being and reduce our ecological footprint, as permaculture and urban farming seek to do, may help us meet the challenge of sustainable development.

4.0 PHILOSOPHICAL BASIS FOR PERMACULTURE

The prime directive of permaculture, according to Mollison (1988), is "to take responsibility for our own existence and that of our children". The underlying theme is one of "working with, rather than against nature", using and benefitting from natural processes, and working within a natural balance to meet human needs. Permaculture stresses individual responsibility and action within a co-operative and collaborative environment. It is based on an assumption that people have the inherent ability and the will to construct and manage systems that allow them to live and interact beneficially with one another and with the physical environment.

At a time of increasing recognition that our present way of living and consumption of resources is unsustainable, permaculture puts forward a way of living and relating to our surroundings that contributes to our ability to live sustainably; reflecting the belief that reconciling individual + society + nature is essential for mankind's long term security and wellbeing.

Figure 4: Urban farming within a co-housing community

At the Winslow Co-housing Community, in the American city of Seattle, residents enjoy seasonal fruits, nuts, herbs and vegetables, grow poultry, eggs, mushrooms and grains, as well as generate compost and mulch. The design also provides green buffers and play space – all in an urban medium density development.

(Photo: Peter Cuming)

4.1 Ecological Responsibility

Permaculture reflects a belief in the critical importance of caring for the earth, thereby making provision for all life systems to continue and reproduce. This entails protecting biodiversity and natural relationships and systems, protecting, strengthening and regenerating natural systems when we are making decisions including considering the downstream impacts of development or "caring for surviving natural assemblies" (Mollison, 1988). Fundamentally this requires society to build a collective awareness of, and understand these natural assemblies or systems as well as its possible impacts upon them.

4.2 Social Responsibility

Equally reflected in permaculture is a belief in the importance of caring for people and equitable distribution of resources, ensuring that people have access to what is necessary for their health and well being, and they do not appropriate them from others, now or in the future, "or we become the final plague" (Mollison, 1988). World population growth has cut the area of productive arable land per person to less than half of what it was, from 0.23 hectares in 1950, to 0.10 hectares in 2007 (Earth Policy Institute, 2009). "The attendant shrinkage of life-supporting resources per person is threatening to drop the living standards of millions of people below the survival level, leading to potentially unmanageable social tensions" (Earth Policy Institute, 2009). It is beyond the scope of this paper to comment on population growth but it appears self evident that better equipping everyone to meet their needs whilst consuming less can diminish competition for these resources and so leave more for others. In turn this diminishes the risk of appropriation of those resources through conflict.

Permaculture also reflects social responsibility by equipping people to forge a direct connection with their surroundings and with each other, allowing people to "put down roots" and develop a greater sense of awareness and attachment to their surroundings as the source of their well being. In the UK the City Farm movement provides an example of people forming communities, developing horticultural knowledge and accessing opportunities to develop skills, make a contribution and gain recognition in this way (Federation of City Farms and Community Gardens, undated).

5.0 CONCLUSION

One of the most pressing contemporary challenges facing society is protecting the liveability of our settlements at a time when more people are competing for diminishing resources. Architects, planners and others responsible for the design of our towns and cities have an influential say in the application and allocation of these resources, consumption patterns, and their capacity to provide for themselves.

Applying permaculture principles to the way we plan our settlements and housing helps equip people to utilise natural processes to meet their needs where they are and reduce their dependence on non-renewable fossil fuels and commodified, mechanical resources. Permaculture importantly provides the opportunity to 'reconnect to the earth' and keep connected to it, and to each other in a mutually beneficial relationship, increasingly necessary to deal with these challenges.

Applying permaculture principles can increase the resource base available to all in the city environment by harnessing wild, domesticated and synergistic materials and energy, through applying the principles of caring for the earth and each other, and equitably sharing any surplus to that required to meet our needs. In this way permaculture and urban farming can help to reduce our ecological footprints and aggressive impact on the planet by "working with, rather than against nature" (Mollison 1988).

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