# WHAT IS PERMACULTURE?

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## Abstract

Modern consumptive lifestyles are intrinsically connected to a swathe of environmental, social and economic issues. This includes but is not limited to biodiversity loss, pollution, human induced climate change, inequality and injustice. Permaculture has grown from a recognition that "conventional agriculture is the most destructive human activity on the planet and the desire for a workable alternative"(Palmer & Grubb 2015)

Throughout this paper many definitions are given for Permaculture, some are definitions given by its founder's others are conclusions drawn from observation, interaction and research. The aim of this paper not to pin down permaculture to a particular definition but rather to elucidate information around the subject and explore some of the many shapes, forms and faces that permaculture can take.

Through a combination of research, attendance of a Permaculture Design Course and experimenting with ideas on the ground the author has immersed himself within the field in an effort to understand and contribute to the movement.

In 2014 a review was conducted by Lovell and Ferguson. This is considered by the author to be the definitive paper as far as analysis literature pertaining to the topic is concerned. This paper aims to extend on that work by exploring further the practical nature of permaculture. The systems in operation, under development and the practical means by which people attempt to design and implement such systems.


## Introduction

The theoretical concept of "Permaculture" is a vision for humanity's sustainable subsistence first introduced in 1978 by David Holmgren and Bill Mollison in their seminal work "Permaculture One" (Furguson & Lovell 2014). The definition introduced at that time was "an integrated, evolving system of perennial or self-perpetuating plant and animal species useful to man" (Holmgren & Mollison 1978) Permaculture is now defined by Holmgren as "Consciously designed landscapes which mimic the patterns and relationships found in nature, while yielding an abundance of food, fibre and energy for provision of local needs. People, their buildings and the ways in which they organise themselves are central to permaculture. Thus the permaculture vision of permanent or sustainable agriculture has evolved to one of permanent or sustainable culture" (Holmgren 2016). Mollison is now quoted to have said when asked to define permaculture "Google it" (Palmer 2016c).

Over the years since its inception permaculture has been under constant and rapid development. A concept network analysis performed (Furguson & Lovell 2014) of available literature on the topic shows that permaculture has evolved over the years to increase focus on certain concepts and reduce focus on others (See appendix 1) Although the core vision remains as the remodelling of human subsistence to be ecologically responsible, the approaches to realization of this vision have differentiated and expanded. In the early years of permaculture 1978 – 1992 the central concepts of the field were "Agriculture" and "Design". This shows that the first 14 years' permaculture was primarily focused around these two concepts. In the 9 years that follow (1993-2002) the core focus of permaculture has moved away from agriculture (still present but less prominent) to "Sustainable" and "Design". The most current network map, spanning the years 2003-2013 provides what may be the closest thing to a working definition of permaculture. This concept network map is shown below in Figure 1.

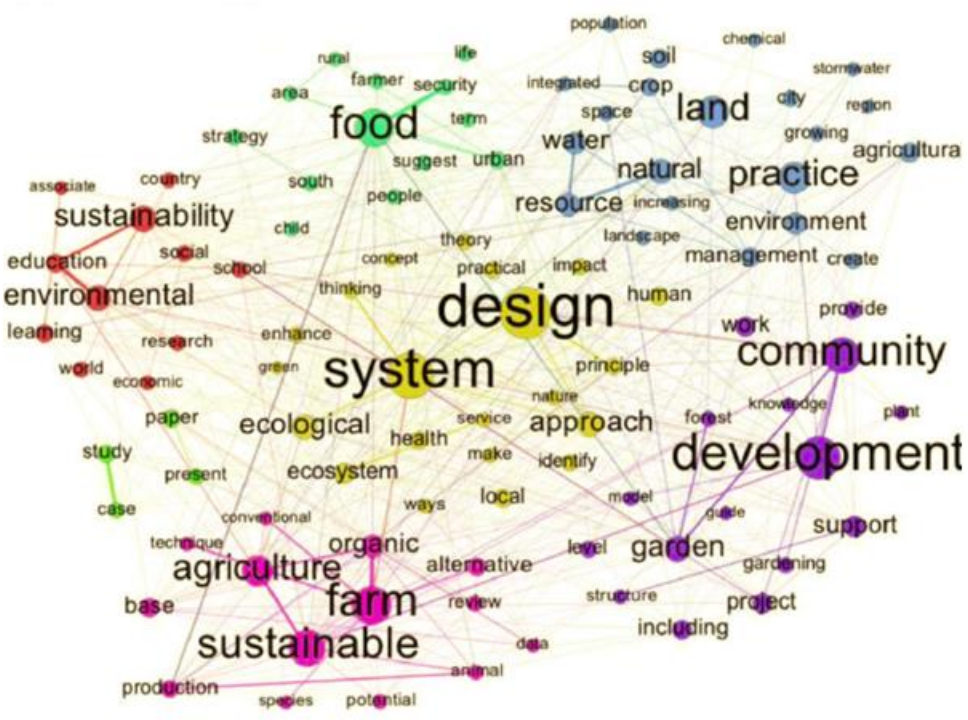


*Figure 1 - Concept Network Map of Keywords from Permaculture Publications (2003-2013). Node Size denotes centrality of concepts, links represent concept co-occurrence frequency and colour denotes conceptual clusters of tightly interlinked concepts (Ferguson and Lovell 2013)*

This most current concept network map (figure 1) illustrates the movement of permaculture toward the key concepts of “Design” and “System”, these concepts are “tightly interlinked” within the literature and this entanglement could be possibly construed in at least two ways. 1) Permaculture is concerned with system design or 2) permaculture is concerned with a design system. From research of the literature and attendance of the design course it is clear that both are true. Permaculture is focused on the design of permaculture systems (Palmer & Grubb 2015) and is also focused (some more than other) on design systems that will streamline the creation of productive and effective systems (Palmer 2016f).

Permaculture design has been under development since 1978 when the word was first introduced by David Holmgren and Bill Mollison. Since its inception Permaculture has undergone significant development and differentiation (Furguson & Lovell 2014) Permaculture is now an umbrella term that is associated with activities and systems embodying certain ecological qualities. The qualities that define a permaculture system are not easily quantified but David Holmgren's 12 principles are considered to be the closest thing to a measure of whether or not a system is or is indeed permaculture. The 12 principles are as follows: 1) Observe and interact 2) Catch and store energy 3) Obtain a yield 4) Apply self-regulation and accept feedback 5) Use and value renewable resources and services 6) Produce no waste 7) Design from patterns to details 8) Integrate rather than segregate 9) Use small and slow solutions 10) Use and value diversity 11) Use edges and value the marginal 12) Creatively use and respond to change (Holmgren 2004). These principles are linked closely with three ethics that together form the foundation of the permaculture movement and the systems they wish to create. The three ethics are as follows: Care for Earth, Care for People and Fair share. These three ethics are similar to the 3 pillars of sustainability (Environmental, Social and Economic) as pointed out by (Kruger 2015a).

The aim of Permaculture Design is to create sustainable, self-perpetuating and ideally autonomous systems that can perform one or many functions in an ecologically responsible way. The only way in which this is possible is to attempt to consider the whole system with its networked interactions to the wider environment over the its life cycle. Permaculture design is currently practiced by thousands of people around the world and the techniques and approaches are varied. The field is diverse and with little standardization in the dissemination of the topic permaculture evolves from teacher to teacher. Since it is only a relatively new field of study and practice, what goes on currently is often an effort to identify and develop the effective and relevant techniques and approaches to effective design and practice. In this paper the author aims to elucidate on the design approach presented by the permaculture design team "Very Edible Garden (VEG)" the directors of which are students of both Mollison and Holmgren and have made significant progress toward developing a rigorous design process that can be used universally to develop sound permaculture systems see (appendix 4).

## Vision

Permaculture is in part visionary, the statements that have traditionally been seen as definitions of permaculture are now being recognised as visions set by the founding "fathers" to give direction and structure to the movement of permaculture. What kind of world do we want to create? What kind of world do we want to live in? how do we want it to feel? These are the kinds of questions that one would ask in the formation of goal or vision. I want clean air, rivers and oceans free from pollution, healthy communities, vibrant landscapes, abundant food, a healthy mind a body. What do you want? Take a minute to think about how you would like the world to be. The vision of permaculture is not and should not be narrowed down to a strict definition. David Holmgren's "Consciously designed landscaped that yield an abundance of food, fuel and fibre" (Holmgren 2016) is pretty well on point but "consciously designed" that is subjective and differs astronomically from person to person. A technique of vision formation currently being brought into the field of permaculture by Palmer and Grubb is Holistic Management. Holistic management has been introduced by Allan Savory as a method by which any number of people can come together and collectively form what is called a "Holistic Goal". Holistic Management is heavily entangled with ranching and desertification but information about the pretext can be found in Savour's book "Holistic Management". The book includes some information about grazing as a tool for land regeneration, this theoretical framework is an altogether different subject and the use of cell grazing and other grass fed beef techniques are not being supported not disputed here. For an example of the type of holistic goal being referred to in the context of permaculture design see Appendix 3. The vision may be specific to a particular area or it may be a general view of how the world is desired to be. The core tenet is that "Clear, explicit, coherent intentions generate a powerful creative force" (Jacke & Toensmeir 2005a, p. 156).

## Theory

Permaculture seeks to be a generative process. Something that responds to the environment in question to generate appropriate and effective solutions to local climate and geography. Natural ecosystems vary considerably from place to place and so in order to create effective systems so to must the permaculture vary. Depending on the location and corresponding climactic conditions natural ecosystem may take the form of forest, marshes, woodland, deserts, tundra or others. Within these ecosystems, patch variations exist depending on the microclimate, soil variations and other conditions in the environment. This variety in ecosystems both spatially and across their trophic levels contain a thematic pattern. Elements are matched to their environment, each species

or plant and animal has a niche that it occupies and if that niche is not available it has difficulty surviving (Jacke & Toensmeir 2005a, 2005b). This result is that in each and every ecosystem different collections of elements and different working dynamics are present. In the same way that ecosystems find stability and sustainability in matching their needs with what the local setting can provide permaculture systems are (or should be) unique and adapted to be appropriate to their environment.

### Design

The first step of a good design is to survey, analyse and communicate information about the site or situation where the design is to occur. This is generally called the observation phase and consists of two separate entities; Site and people. The site analysis involves the procurement of information about the current context of the site. This information includes but is not limited to: Climate and landform, geology and soils, slope and topography, aspect, wind and solar sectors, water flows and reservoirs, roads and access, trees and vegetation, animals, structures, microclimates, resources, regulations, limiting factors (Holmgren & Mollison 1978; Palmer & Grubb 2015) These factors are chosen due to their relevance to the design as potential hazards or resources depending on the context. The aim of this analysis is to gain as much insight as possible into the characteristics of the site that will affect the design.  The people analysis aims to understand the people who will use the site, this is important because the system will need human management and maintenance. Therefore, the system must be matched well to the users as well as to the site. People analysis generally includes: Goal articulation, time available, budget, skills, experience, enthusiasm, existing site use, desired aesthetic, wish list and limiting factors (Palmer & Grubb 2015). Once the site and situation are well understood a conceptual map can be generated that matches design elements or conceptual areas with appropriate locations within the system. The garden goes where there is sunlight, access, water ect. Functional interconnection of system elements combined with logical placement for access and microclimate suitability are key spatial reasoning strategies used within permaculture design. From the conceptual design through to a more detailed design, understanding the ecological connections of the elements to the greatest extent possible is essential to creation of effective design.

## Detailed Specification of the Problem

Permaculture is many things, being a scientific discipline is not one of them. Permaculture is; a design system for sustainable living and land use, a systems-based worldview, an international movement, a suite of practical strategies and techniques, a way of life incorporating all of the above, [and] a profession (Palmer & Grubb 2015).

Much of the theory underpinning permaculture is based upon ecological ideas that are difficult to verify through scientific means. Gardeners throughout time have rarely looked to scientific institutions for guidance on how to maintain a successful garden but instead share information received from other gardeners or from personal experience. When something works well in the garden it may then be shared as a good technique. The issue with this type of information dissemination is that it is unscientific. A technique or strategy that works in one garden may not work in another, incorrect conclusions can easily be drawn from the complex dynamics of the polyculture and also ideas that seem effective in the short term may turn out to be disastrous down the track or fail completely if applied incorrectly, in different locations or in different ways. The risk is there but what options do they have. A common idea in permaculture is the use of nutrient accumulating plants such as comfrey (Jacke & Toensmeir 2005a, 2005b) the folk law essentially goes that plants such as these use deep root systems (up to 2m) to extract nutrients and minerals from

below the surface. The plant then accumulates these mineral in their leaf matter and as they die of at the end of summer the nutrients are made available to the shallower root systems of fruits trees and other plants reducing the need for fertilization. Information in the scientific literature to dispute or support this claim is difficult to identify. This is just one of many aspects of permaculture practice that is unsubstantiated by science but remains to be proven false. The high levels of complexity resulting from the ecological dynamics of the permaculture system and non-standardised approach to its design and management could explain the complete lack of empirical evaluation of the system. Approaches to permaculture have not been standardised for several reasons. One reason for this may be that the best approaches to permaculture are not yet known, many attempts at permaculture have failed and many have flourished. Regardless of the outcome, lessons have been learned the movement rolls on.

A common critique of permaculture is the lack of scientific experiments to validate its approach, controlled experiments have been suggested that would compare plots grown using permaculture and plots using traditional approaches. This type of experiment is critically flawed: traditional techniques may be applied within the permaculture systems; systems can take centuries to establish; permaculture is not standard; permaculture is not mature a discipline. The notion that permaculture is restricted to polyculture based agriculture resembling a 'food forest' is outdated. A core tenet of modern permaculture is appropriate and effective solutions for the particular scenario. Whether that means a "Food forest" type scenario or a monocrop field really depends on land use goals and the site physicality. The permaculture system may resemble an organic farm; it may resemble a forest or it may be a diverse mosaic of different plots with different strategies applied. It really depends on the people and place.

Another problem facing permaculture is that over the year's permaculture has become riddled with cliché, in an effort to simplify the vast complexity of the permaculture approach many have reduced the practice to a few palpable strategies. Swales, food forest, herb spirals, ducks, no-dig gardening, chicken tractors and Keyline roads or ploughing are examples. While these techniques may be effective and could well be included within an effective permaculture they are not essential and are more appropriately considered to be techniques or strategies that could be drawn upon in the design, establishment and management of a permaculture system, as the Buddhist proverb goes "It takes a finger to point to the moon, but woe to the person who mistakes the finger for the moon" (Jacke & Toensmeir 2005b, p. 141).

The system itself is intended to be a self-supporting ecosystem, generally relying on the maintenance and management of human beings. The idea is to use spatial and ecological design tools to reduce this input as much as possible.

The problem at hand is that relatively little is known within scientific literature about the true nature of permaculture. The way in which systems are designed and the nature of the systems once established.

## Description of the methodology to solve the problem

Permaculture is an attempt to address the combined ecological impacts of human beings exhumed through the ways in which they have come to source their food, clothing and shelter (Palmer & Grubb 2015, p. 19) As a proposed and potentially powerful discipline for addressing a myriad of sustainability issues it is the intention of the author to explore further the current state of play. It is the hypothesis of the author that considerable examples of permaculture exist outside of literature

and as a way to explore this field a survey and analysis of key permaculture systems within Australia will be conducted.

As an investigation of permaculture and related design process a survey shall be conducted to determine the prevalence of design process within permaculture systems along with the analysis of the structural and dynamic makeup of permaculture systems. Many systems may not be decidedly permaculture as yet, the defining factor should be that they have permaculture principles within their objectives and have some form of recognised design process within their systems. The objective of this investigation is to ascertain first and foremost the nature of the permaculture systems in operation, what are their components, strategies, outputs and inputs. It is the hope that this investigation will identify resilient and productive systems and if so identify aspects of those systems that render them successful.

As somebody who has immersed themselves in permaculture, has studied its content and experimented with its ideas the author will partake in active research. Using tools and methods acquired during the research phase of this project the author will be able to participate directly in the inner working of the permaculture systems, through the WWOOF (willing workers on organic farms) program. Farms or systems will be selected upon recommendation and interest in an effort to identify some of the best working examples present in Australia. A journal will be kept detailing general observations about the systems, the core components and processes in use, the working objectives of the system managers and the techniques and strategies utilized to achieve them. Along with notes and observation, photography and sketching will be used. It is the intention of this investigative survey to identify themes, patterns and statistical information about the on-ground reality of the systems and practice. In order to not restrict this observation specific questionnaires, or matrixes will not be performed from the outset but will instead be brought in over time as the information begins develop.

## Detailed discussion of work completed

The first step in the process of exploring this subject was the attendance of a Permaculture Design Certificate. The content of this course has only been lightly touched on in the body of this paper but it was substantial. The course went for 14 days and included hands on design experience with the ultimate aim of establishing a “solid foundation in permaculture design and leave[ing] course participants with a demonstrated ability to complete sound permaculture design [with] a solid grasp of permaculture as a framework on which to build” (Palmer & Grubb 2015).

During the course it was identified that a core element in the design process is the generation of quality site information and displaying it on maps. In order to expand knowledge in these areas Cartography, GIS and Geology courses were taken as undergraduate electives. These were chosen due to their availability as well as potential applicability to permaculture.

Once this was completed initial efforts were made to implement design ideas on the ground and to practice permaculture. The practice has been conducted in Armidale, Australia, an area of cool temperate climate in northern NSW. The practice conducted three months included preliminary survey and design, pruning, composting, planting, fencing, gardening, building, some minor earthworks, shed design and building, plant propagation, exploration of forests within the local area, work at the community garden and within the community, the establishment of four preliminary design projects and some experimentation with garden bed creation and land restoration. The main property where the author is based contains the relics of what was, 22 years ago an active permaculture focused system. The previous owners planted many fruit and nut trees including:

Apple, cherry, peach, plum, pear, nectarine, feijoa, quince, almond and pecan. Along with these trees many perennial vegetables and “beneficial plants” were present. Also present on the property were roughly 13 acres of pasture with several farm sheds, milking cow and bail, two dams and some native woodland. Since the departure of the previous owners many of the trees and plants have died but many remain. The native woodland has been extended on and nourished and some trees have been maintained. The aim was of the work on the property is to make it productive. To take whatever measure possible to increase soil fertility, water retention, reduce herbivory from insects and to learn effective techniques to achieve these goals.

Key works completed so far include the preliminary design of the 20 acres property. Acquisition of approximately 16 $m^3$ of wood mulch, the extension of yard area protected from stock, planting of walnuts, cherry, comfrey and initial attempts at gardening. See Appendix 5 for pictures.

Alongside this initial experimentation in permaculture practice a literature review of permaculture has been conducted with specific focus on the systematic and logical design tools introduced and explored at the PDC. Core conclusion from the review were the relatively small amount of information in the scientific databases around these ideas and the wide breadth and complexity of the subject.

## Conclusions and Future work plan

While Mollison and Holmgren pioneered the practice of permaculture and have contributed significant amounts of literature and experimentation to the topic, permaculture is now out of their hands and is a self-defining and self-sustaining entity. Permaculture is an approach to engineering much in the way that science is an approach to knowledge. “Alhazen” is attributed with laying down the foundations of the scientific method over 1000 years ago (Wikipedia 2016). “The Book of optics” which contains experimentally derived logic paved the way for modern scientific inquiry. Science has come a long way since then and it would be foolish to consider this the “bible of science” as many consider Bill Mollison’s “Permaculture Designers Manual” to be the “bible of permaculture”.

# Appendix

## 1.1 Concept Network Map of Keywords from permaculture publications

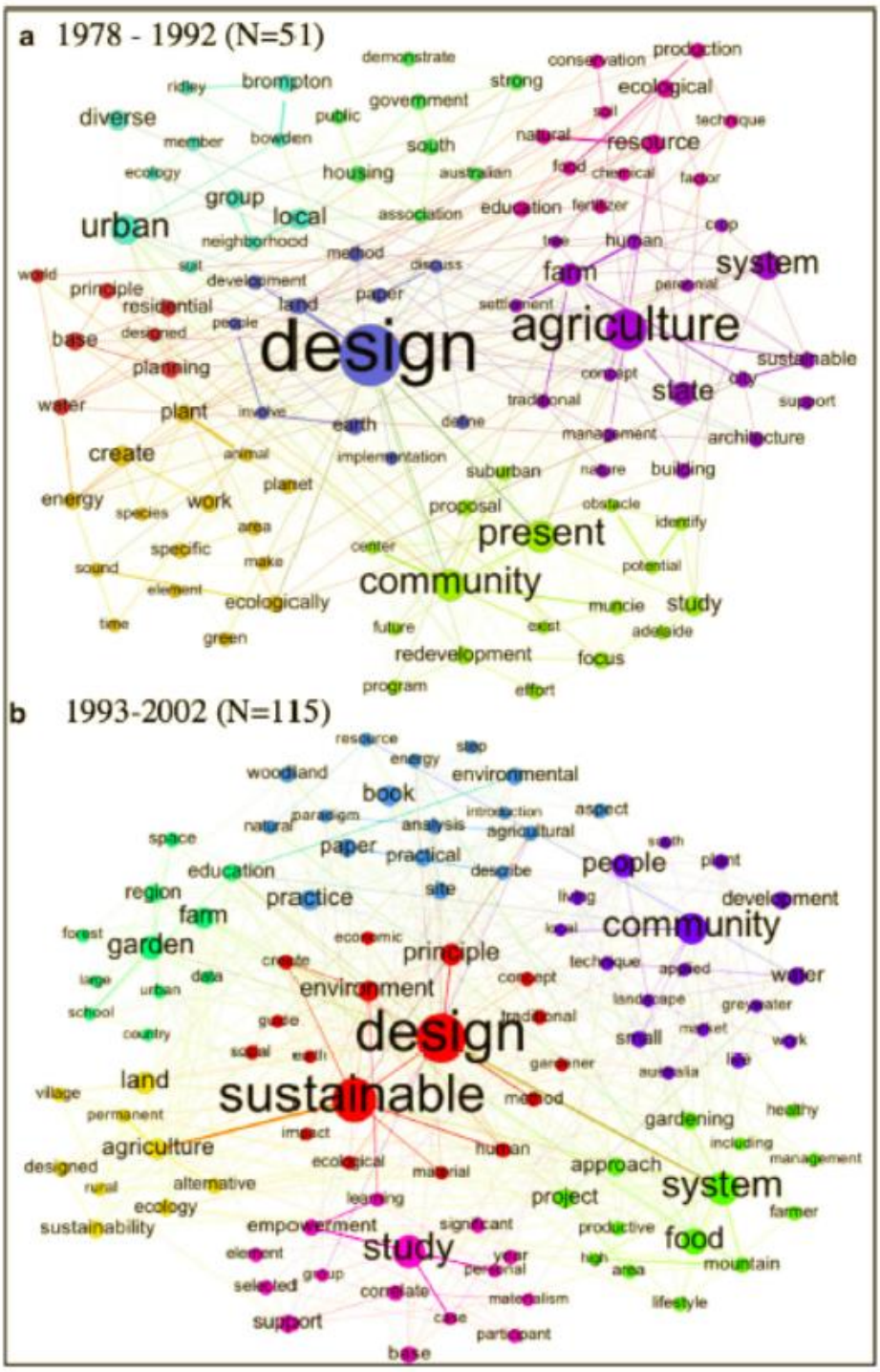


Figure 2 – "Concept network maps of keywords from permaculture publications. Node size denotes centrality of concepts, links represent concept co-occurrence, link width represents co-occurrence frequency, and colour denotes conceptual cluster of tightly interlinked concepts. a Publications 1978–2002 (N=51). b Publications 1993–2002 (N =115). c Publications 2003-2013 (N=157). d Complete series 1978-2013 (N =230)" (Furguson & Lovell 2014)

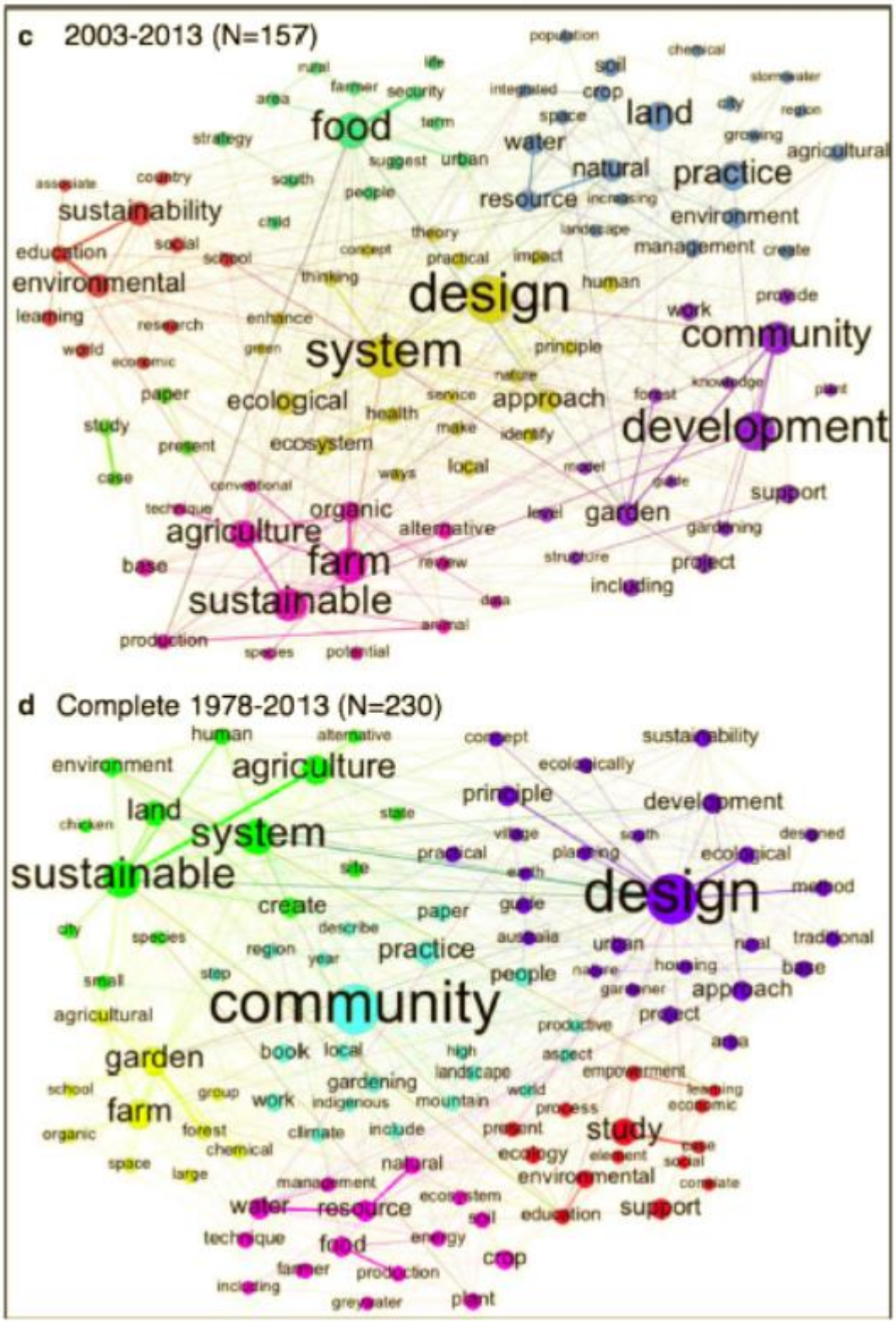


Figure 2 cont.

## Appendix 2 – Holistic Goal Formation

This is an example of how one could go about forming a Holistic Goal. Taken from a design meeting conducted with Simon and Irene, a de facto couple that wish to invigorate their house yard. The objective of this exercise is to form a collective vision for the two clients.

**Step 1** – The clients were asked about how, in 5 years when the project is complete do they want their place to be.

Responses

Low maintenance, functional, flowing, peaceful, exuberant, lively, suitable aligned to our skills, productive for food, art (stimulating), inspiring, magnetic, interesting textures and backdrops, natural light, free from hard edges, organic feel and uncontrolled.

Along with these words that describe the future holding a wishlist of component features was also highlighted

Wishlist

Dogs, dancing area, seating, guitar sculpture, purple floral mint, solar energy, shed, compost, veggie patch, social area, fire pit and less lawn.

**Step 2**

Now that a complete list of words describing the place had been established the clients were then asked to indicate how important each term was to them and the list was iterated to cut through the most important stuff.

2nd iteration (how will the place feel)

Low maintenance, peaceful, pockets, aligned (to skills and enthusiasm of clients), productive, inspiring, textures, backdrop, organic, rounded, soft

Note: This process is being somewhat made up on the fly

**Step 3**

The clients were then asked to write a sentence that encapsulated these terms.

Simon – Our backyard will be LOW MAINTANENCE and a peaceful and productive environment to grow organic food and to create inspiring work in a backdrop of soft, rounded and aligned spaces with pockets.

Irene – Our beautiful backyard is full of soft, rounded and organic pockets, that are measures of peaceful and inspiring spaces. Simon isn't doing anything except producing amazing art and veggies. He enjoys how low maintenance the various patches are. I am reading a book.

Note: Clients were asked to write one sentence, upon reflection this is an unnecessary constraint and may have limited the response.

**Step 4**

Clients were then asked to read each other's responses and identify the parts that they liked. The most popular statement or expressions where then listed and another iteration conducted. This was then used to form another set of sentences and the best one was selected, edited and presented to the clients.

Holistic Goal: Our Backyard is a peaceful and productive environment to grow organic food and create inspiring work. Free from hard edges it is a smooth, colourful and rounded space. The garden is low maintenance, vibrant and productive. It is suitably aligned to our skills and lifestyles and provides a diverse mix of characteristic backdrops for filming and enjoyment. The backyard in general is lively, flowing and peaceful with an organic, un-pressured feel.

This vision will now serve as a guiding statement against which future design decision can be weighed.

## Appendix 4 – Design Proccess

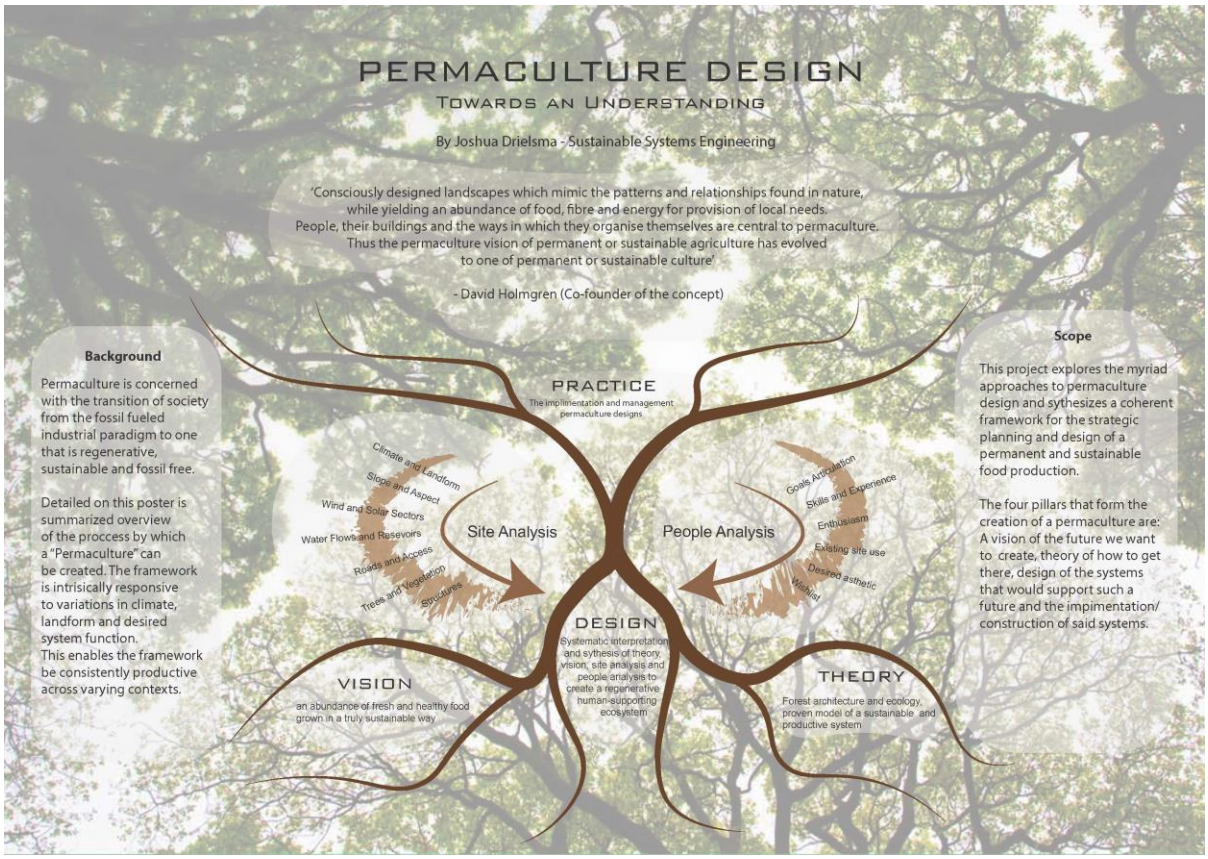


Figure 3 – Project poster showing design process concept (Drielsma 2016)

## Appendix 5 – Work so far, experimentation and application of ideas

Shown below are several pictures of work so far completed for this a design project. The activities shown represent a learning and experimentation process where mistakes are made and conclusions drawn. All photos are provided courtesy of the author and are not intended for distribution.

Figure 4 – Redefining the project bounds to increase possibilities. The four photos show a sequence of works.

Figure 5 – Approximatey 16 $m^3$ of locally sourced wood mulch, this mulch has been made from private household and city council tree maintenance. It is to be used for soil building.

Figure 6 – Composting. food scraps are sourced from a college kitchen at the local university (using blue, sealed tub pictured. Food scraps are covered with organic matter (wood chips or herbaceous weed matter) and turned with each addition.

Figure 6 – Garden experiment, to the left pruning's from fruit trees placed in circles (winter) to the right, 2-3 months later after application of manure and compost (spring).

Figure 7 – Area of disturbance from earthworks, old fence, new fence and application of wood mulch.

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