Permaculture Frontiers

A Critical Exploration of Permaculture's Global Role in Sustainable Development

A Thesis Submitted In Fulfilment Of The Requirements Of The University Of Salford For The Degree Of Master Of Science

By Oliver Smithies

September 2019

Abstract

Despite emerging literature on Permaculture as a sustainable solution-based approach to the environmental, economic and social consequences of non-sustainable global growth, many accounts infer it is a political practice working against many corporate and bureaucratic forms of power. Using examples of Permaculture from a global context, such as 'Omah Lor' - a demonstration hub situated in Java Indonesia, Incredible farm in the UK, and various applicable advances in technological design, this paper focuses on the practices and key drivers of Permaculture in order to illustrate that the movement is, potentially, a cohesive component in assisting policy makers moving towards a sustainable future. Alternatively, this paper draws on ethnographic data to focus attention upon the 'mainstreaming' of 'regenerative activism', arguing that guiding core principles (and the associated impacts of these principles) alongside the foundational value ethics within Permaculture are important considerations for policymakers who share a global common discourse in sustainable development. As yet, this point is still widely underacknowledged at policy level.

Acknowledgements

Firstly, I would like to thank my research supervisor, Dr Michael Hardman, who is based in the School of Science, Engineering and the Environment at the University of Salford. The journey of conducting research has been made possible by the kind guidance and support offered so openly by Dr Hardman. I have learned a lot from his continued research on Urban Agriculture, sustainability and the similar ethnographic approach, he so fascinatingly pioneered, in guerrilla gardening.

On a personal note, I would like to sincerely thank my family, for understanding and supporting me and continuing to encourage my choices to explore, document and teach sustainable practice. I express my deepest thanks to my friends and associates, and the Permaculture activists (some of whom are documented within this thesis) who welcomed me into their world and allowed this thesis to take form. Finally, a personal thank you to Jay Bain for his encouragement and guidance.

Declaration

This is to confirm that this thesis consists of my own work conducted through the University of Salford UK. The contents of this thesis have not been submitted for any other evaluation apart from this submission for the degree of Masters By Research.

Contents

Table of Contents

Tables

Figures

"Climate change could become a catalysing force for positive change- it could be the best argument progressives have ever had, to demand the rebuilding and reviving of local economies; to reclaim our democracies from corrosive corporate influence; to block harmful new free trade deals and rewrite old ones; to invest in starving public infrastructure like mass affordable housing; to take back essential services like energy and water; to remake our sick agricultural system into something much healthier; to open borders to migrants who's displacement is linked to climate impact; to finally respect Indigenous Land rights - all of which would help to end grotesque levels of inequality within our nations and between them."

Klein (2014, p.7)

CHAPTER 1

Introduction to the research

In light of the environmental, economic and social consequences of non-sustainable global growth, alternative social movements have materialized to demand the transition towards sustainable systems. This study focuses on Permaculture as a sustainable solution, given the rising global population and the affiliated pressure upon resource management.

Despite emerging literature on Permaculture, many accounts infer it is a political practice working against many corporate and bureaucratic forms of power. This study investigates permaculture frontiers, in relations to this claim and explores the potential for permaculture to be assimilated into mainstream policy and efforts, to combat climate and socio-economic crisis. Specifically, to understanding permacultures place within the existing framework, and whether it can work within partnerships, as desired by the UN initiatives calling for collaboration of Major Groups.

The study begins with a review of the literature to define permaculture, expose its principles, practices and applications. To understand Ideologies of political mainstream acceptance, key stake holders and their frameworks for informing policy are explored to find any potential to bridge the gaps between systems and frameworks, in the interest of achieving share actionable goal's Drawing on ethnographic data to focus attention upon the 'mainstreaming' of 'regenerative activism', arguing that guiding core principles (and the associated impacts of these principles) alongside the foundational value ethics within Permaculture are important considerations for policymakers who share a global common discourse in sustainable development. As yet, this point is still widely underacknowledged at policy level.

This research explores multiple case studies which define the actions undertaken in the domain of Permaculture in both the global north and the global south, in order to illustrate that the movement is, potentially, a cohesive component in assisting policy makers moving towards a sustainable future.

From the global south, an ethnographic study of tropical Permaculture in Java, Indonesia is presented; whereby sustainable architecture, forest gardens and social Permaculture infrastructure are sculpted to optimize commercially viable produce. From the global north, a case study is presented from Todmorden, UK, where a commercially focused enterprise rallies to create local food security. Simultaneously, key global participants and stakeholders of Permaculture are interviewed, to gain insight into current efforts to aid sustainable development. The interviews explore a range of applicable areas within the industry, such as good practice, advanced technological design, social integration in the technological age and effective communication methods for collaboration. Using appropriate techniques to evaluate impact and behaviour, this study provides an in-depth exploration of perceptions and attitudes around using these principles, ethics and methods for future strategic development. Finally, recommendations going forward are discussed and highlighted, to be used as a guide for Permaculture designers, policy makers, and stakeholders. This provides a reference of relevance, when assessing project effectiveness, in line with international policies and agendas. This is, perhaps, the first research piece to use an ethnographic approach which collates effective Permaculture applications, sustainable development goals, communication models, ecological design (using technological frontiers), and specific economically viable avenues, in the interest of more permanent and ethical agricultural enterprise.

Problem

Global human population throughout the industrial revolution, to present, has shown exponential growth (Cohen 1995). Amid increasing population densities and rapid urbanization of landscapes, we are witness to the loss of green spaces and biodiversity (Sanderson et al 2002). The loss of green spaces and biodiversity has detrimental effects upon on human health and wellbeing, together with contributing to climate change (Pecl et al 2017).

Global rates of native forest deforestation, between ‘2000 and 2015, ranged between 5,770 and 10,483 million ha/year, resulting in a global loss of 124.8 million ha of native forests during this period’ (Keenan et al. 2015, p.1). The severity of the situation can be witnessed in the Brazilian Atlantic Forest, a phytogeographical domain, which has been reduced to less

than 12.0% of its original coverage (Paviolo et al 2016), from originally 130 million ha to less than 17 million ha, now divided into more than 240,000 patches (Ribeiro et al, 2009). Taking a species-specific viewpoint, due to this drastic landscape transformation, wildlife populations such as the jaguar (*Panthera onca)* remain highly threatened (Paviolo et al, 2016). Only 7% of suitable habitat remains in good condition. Jaguars now exist in around only 2.8% of the region.

Subsequently, biodiversity loss though wilderness land use transformation is emphasized by Pardini, Nichols & Püttker (2017). In the global south, demand for large-scale agriculture, logging and mining dominates land use and is responsible for the wide-scale decrease in biodiversity hotspots in; Indonesia (Poffenberger 2006); across the amazon rainforest; the Atlantic forest of Brazil; and, the democratic Republic of Congo (Turubanova, Potapov, Tyukavina & Hansen, 2018). Weisberger (2013) gives his ethnographical account of these effects on Indigenous peoples of the amazon, who suffer from the dominating effect of land grabbing, as corporate governance over resources displaces their communities. As a result of corporate insensitivity and environmental desecration, concerns increase regarding the longevity of existence for many ethnic cultural groups in this region. The collective knowledge of peoples, such as beneficial plants for healing, by those who have lived an existence emerged in nature for millennia, as guardians of the forest are now on the brink of extinction (Weisberger 2013). The associated environmental impacts and human issues, such as the effect on indigenous peoples and communities are interconnected at all levels.

Two human considerations are thematic throughout the world 1) Rapid urbanization (Mollison, 1988) with a need for sustainable infrastructure (Kennedy 1991;Holmgren, 2007) and, 2) rural bio-diverse, wilderness land use change of purpose is currently supporting economic trends (WFO 2019; IFOAM, 2019) , attributing towards global health issues. Subsequently, ruling governments are witnessing ever-increasing pressure to implement strategies, such as the United Nations Sustainable Development Goals to improve lifestyle tendencies yet attain environmental targets (WHO, 2016).

Despite the diversity of consumer demands, the effects of resource extraction in biological hotspots is extensive (Poffenberger, 2006), invasive and global in scale (Campbell et al, 2008), resulting in the desertification of pre-existing ecosystems, evidenced on every continent.

Campbell et al (2008) identify this global epidemic plague of misused lands as being a major and direct contributor towards climate change and food security. A solution to both problems could be facilitated through the use of abandoned agricultural lands for bioenergy agriculture.

Towards a Solution

The imbedded complexities and diversity of influences over global land use make finding solutions towards sustainable development and outcomes extremely difficult. In cases such as national forest management in Indonesia, advancing commercial acquisitions in the timber trade and unclear land tenure rights have resulted in the continued capitalisation of rich biodiverse ecosystems (Poffenberber, 2006). Emerging from the chaos, governing bodies, policy makers, NGOs, and stakeholders have begun to observe cases of effective solutions to land management, not only in the sustainable domain, but also through regenerative actions (Poffenberger, 2006). Despite the decline in biodiversity hotspots, hope for the potential of ecosystem restoration is provided, in the work of Crawford (2010) in which intensive, species rich 'Forest Gardens' are beautifully crafted, not only to provide human sustenance but to generate ecological resilience.

Combined with policy support, the recent rise in the 'forest garden' approach, through Community Forest Management, gives a glimmer of hope for human settlement and ecological balance. This has been proven to be effective in spaces such as the Krui District, Sumatra, Indonesia (Poffenberger, 2006). Further down the product pipeline, in South America, livestock grazing is identified as the key driver in land conversion from old growth forests to ranching; of which Gonçalves, Fischer and Dirzo (2017) call for guidelines to be provided for managing landscapes, under this omnipresent type of land use. In evidence of this, Kim & Kirschbaum (2015) state that 'land use change from natural forests to agricultural lands contributed to a cumulative 1569 ± 43 Gt CO_2 eq between 1765 and 2005. This is equivalent to average emissions of 6.5 ± 0.2 Gt CO_2 eq per year'.

Due to overlapping environmental objectives and needs of local communities alongside international politics, the focus of integrated sustainable practices is becoming more prominent. In 'Permaculture: A Designer's Manual' by Mollison and Holmgren (1988), the

holistic approach of employing permanent agriculture, in the interest of local economic stabilisation and prevention of resource mismanagement, has been effectively communicated and has amassed growing support. Unlike the generalist approach to ecological design, research into Permaculture has been dominated by 'land and people based' studies, thereby positioning itself somewhat separately to specific, more orthodox disciplines and understandings of stability, resilience, sustainability (Richards, 2014) and agroforestry (Ferguson and Lovell, 2014).

Although complex, the reduction of global diversity and escalating carbon emissions requires immediate solutions. Addressing human settlements and the management of human interactions together with natural wild spaces is becoming fundamental in moving towards resolutions (Mollison 1988; Poffenberger, 2006). Scott (2010) distinguishes Mollison and Holmgren's 'Permaculture' from other 'unorthodox' agriculture, due to its focus upon integrating all the components of a human settlement: building construction, farm layout, transportation, hydrology, energy management, and community relations in addition to food production, however, Scott emphasises the lack of scientific research compiled in favour of the holistic approach to sustainability, stating environmental scientists do not often test Permaculture ideas. Conversely, it could be argued that Permaculturists do not often relate or integrate effectively with emerging ideas amongst environmental scientists.

In pursuit of climate change solutions, ecological design efforts such as the ecosystem services approach are under pressure to convince stakeholders of the benefits of simulating nature, whilst concurrently solving present consumer demands, which are currently dictating corporate decision-making (Mohan das Gandhi, Selladurai and Santhi, 2006). One documented example of observing and mimicking nature, for the purpose of ecological design, is shown through the implementation of 'forest gardens', which focuses on working with nature to grow edible crops and is modelled on the structure of young natural woodlands (Crawford, 2010). At the same time, the common global message on livestock production indicates the depletion of the biodiversity of land areas through forest clearing which results in desertification; however, Savory (2003) argues that the key to re-greening the world's deserts, to 'reverse climate change', can be accomplished by mimicking natural grazing herds, whereby livestock are moved over vast wastelands, or through other systems of mob-grazing. Savory (2003) presents convincing case studies of deserts reforming into grasslands through

mass livestock management, instigating the process of ecological succession. Savory (2017) stresses the most important single factor of climate change is the 'management of global desertification', not livestock, oil or any other industry. Constructively, this brings both hope and focus to the magnitude of the global climatic and biological issues at hand, when observing the concepts of interconnected ecological systems planning. In more recent years, the holistic approach towards human settlement integration within ecological design, pioneered by Mollison (1988), adapts multi- disciplinary frameworks, in order to answer the current global demand for sustainable infrastructure.

The Wider Relevance of the Study

Sustainable Development and Climate Change

Most recent climatic factors such as severe natural disasters have induced globalized political pressures for 'climate change impact' and 'sustainable development' strategies (WFO, 2019). Two agendas to tackle these issues are the United Nations Sustainable Development Goals (SDGs) & The Paris Climate Agreement.

The Paris Climate Agreement aims to address the underlying drivers of climate change and greenhouse gas emissions, by requiring countries to submit and commit to 'Intended Nationally Determined Contributions' (INDCs), outlining their post-2020 climate actions (Rogelj et al 2016). The United Nations 2030 plan for Sustainable Development aims to eradicate poverty in all forms. The agenda is a plan of action set out to build on the *Millennium Development Goals* and complete what these didn't achieve. Over the next fifteen years, the 17 SDGs constructed of 169 targets will be integrated to balance the three key dimensions of sustainable development: The economic, social and environmental.

Paton and Johnston (2017) document the importance of 'disaster resilience as an integrated approach', which supports the work of Mollison (1988), as a solution-based methodology to the multidimensional issue of regional, national and global ecological regeneration for the reduction of environmental stressors. Fundamentally, Paton and Johnson (2017) emphasize the importance of reducing community susceptibility to loss and negative consequence, by

mitigating perceived hazards and promoting approaches which build robustness and resilience, to allow communities to return to normality as quickly as possible. This understanding further endorses claims of interconnected ecological systems; echoing the Permaculture principle that diversity [of connections] builds resilience.

Robustness of systems can be generated from actions at all levels. Bulkeley and Betsill (2013) identify the increasing significance of climate change in urban politics of sustainability, arguing that climate protection is not restricted to local or state actions but coordinated through 'relations between global, national and local actors across state and non-state boundaries. In light of this, international climate change agendas have been orchestrated, however, there is still hesitation from governments to commit with extreme and immediate actions, resulting in the 2019 movement of 'Global school strikes', (Taylor Wattsand & Bartlett, 2019) lead formally by youths demanding action and the Extinction Rebellion protests for climate action.

This period in history could be described as one of the most influential anthropological centuries (Zalasiewicz, Williams, Haywood, Ellis, 2011) informing mass species extinction (Ceballos, et al 2015). This has inspired the author into action, to explore the potential of Permaculture's benefits toward action on climate change, its mainstreaming into policy and the barriers that surround this. Since Permaculture's formal inception in the late 1980s, the principles and ethics, of which govern the movement, have been applied to multiple regenerative and social science disciplines, (Hockin-Grant and Yasué 2017; Vishwam and Heckert 2014; Flores and Jabez 2018; Ferguson and Lovell, 2014).

He spent a total of two years observing and interacting with the world of Permaculture on multiple projects. By interacting with a range of stakeholders, the author aims to identify working models of sustainable human settlement. Previous to embarking into tropical Permaculture, the author had been involved with urban agriculture consultancy projects throughout the UK, observing social organic growing movements such as the 'Transition towns' crusade, the 'Incredible Edible' movement and Permaculture design consultancy. Additionally, prior to this piece of research, the author provided research assistance on council initiatives in Urban Agriculture planning in the rural areas of Pendleton and the urban

areas of Salford, to address soil qualities and suitability for community food growing within the city.

Aim.

To conduct a critical exploration of the potential to mainstream the practice of Permaculture; drawing on international and domestic frontier case studies to assess barriers and opportunities.

Objectives.

1. Conduct a critical review of the relevant literature to establish gaps in knowledge and to highlight areas of interest specifically, relating to the practices and policies of Permaculture and its place within the global sustainability crisis. This will Include a review of the 'United Nations Sustainable Development Goals', climate change policy and potential opportunities for Permaculture as a sustainable solution.

2. Investigate potential key participants and stakeholders in the 'mainstreaming' of Permaculture and employ an ethnographically led case study approach, which provides a detailed overview of their actions and motivations.

3. Use appropriate techniques to evaluate impact and behaviour, and give an in- depth exploration of perceptions and attitudes towards using these principles, ethics and methods for future strategy

4. Recommend a framework of evaluation for future projects with a view to feeding into policy, surrounding the impact of Permaculture regionally, nationally and globally.

Structuring the Thesis

This paper initially adopts a study on the key components of Permaculture for contexts, and related sustainability movements to bring awareness to the current frameworks and policy agendas within the global arena.

A qualitative research approach is adopted in phase two to focus on the most successful examples of Permaculture in the global sustainable development field, where case studies from the global north and global south are presented for analysis using interviews and focus groups.

The final phase builds on the previous two, taking into account the discourses of activists. Presenting the accounts of consultations with key stakeholders allows for the identification of the barriers and impacts acknowledged within the permaculture movement. Recommendations are then provided based on all 3 phases.

Identifying Parameters: Constructing an Interdisciplinary Thesis

Research into Permaculture's role in sustainable development is no older than its 1980s formal inception, however, methods relating to the interdisciplinary movement have been in use since humans have grown crops. Research is derived from a multitude of academic and non-academic disciplines: from Leahy's (2018) food security and development projects to Stevovic's (2018) focus on energy efficiency in urban design, to the less academic models shown in the traditional 'how to' guides of Permaculture principles and design (Mollison 1988; Holmgren 2002; Mars, 2005). The interdisciplinary nature of Permaculture as a complete system encompasses not only science but philosophy, social-ecology, mental health, nutrition, conservation, economics, education, resource use and culture (Holmgren, 2007). This paper aims to explore the limitations posed by looking at these disciplines through a lens of separation as opposed to through multi-disciplinary and/or collective approaches. Due to the time constraints and logistical limitations in the production of this thesis, some of these areas could not be addressed in full detail, however, the paper has been discerning in its inclusion of, and engagement with, relevant topics, so as to maintain direction and clarity, effectively resulting in a thematic approach to the processing of relevant data.

As part of this thematic approach, the gathering of data investigates how the core principles of Permaculture are applied and understood by regenerative farmers and social eco-entrepreneurs in a variety of cross continental settings, situations and cultures.

CHAPTER 2

Exploring the Literature

This review introduces Permaculture, the practice of 'permanent agriculture', coupled with the consideration of its relevance and place in global sustainable development. The exploration is directed with specific interest toward Permaculture's principles of design, ideologies and ethical foundations and how they relate to practical implementation, global practice and resultant outcomes. Further discussion is raised pertaining to barriers which may inhibit Permaculture's assimilation to the mainstream sustainable development industry. Reference is also made to limitations informed by cross cultural discourse groups in the arena of decision making among policy makers.

Permaculture, as a topic, is introduced in section 2.2 exploring its activities and connected impacts. It is of the author's view that Permaculture can be used for a vast array of sustainable models. Through evaluation, it is discussed as to Permaculture's role as a potential, yet partial, solution to climate change through assimilation into policy, social structures and economics. Specific key techniques, such as forest gardening, are highlighted to convey high impact potential.

Rapid urbanisation is introduced in section 2.3 which identifies the current state of human habitat and its constant fluctuation of socio-economic needs and structure, due to population increase and the associated impact this has upon climate change and thus food security. Perspective can be gleaned here through a geographical comparison between the global north and the global south.

Key stakeholders in the UNSDGs are outlined throughout the literature, along with the applicable models used by the members of the SDG Major Groups, such as the World Farmers Organisation (WFO). Existing tools such as 'Full Cost Accounting' used by partners in the Major Groups and the Ecosystem Services Approach (ESA) are explored, as potential cross-cultural decision-making methods. These methods, which inform policy making and guide

applicable topics of enquiry, could, arguably, be utilized by individuals aiming to record Permaculture impacts. In doing so, we can postulate the potential for integration. The ' theme of common language' is explored throughout the review of literature, with view to identify the potential for Permaculture to be communicated effectively to help inform policy makers.

2.1 History of Permanent Agriculture

Understanding the historic development of 'permanent agriculture' throughout the ages provides the reasoning and foundation for presented concepts of Permaculture. Awareness of the involvement of agriculture in the 'global crisis is described by Smith (2015), as creating frustration, despair and negativity', however Permaculture is fundamentally 'action-orientated and positive'. Active practitioners have been described by Smith (2015) as 'participators in the creation and evolution of the system,' who 'seek to lay the foundations for a new way of being on earth' through traditional small scale and mixed agriculture' entwined with 'redistributive social justice'. Understanding evolutions of agro-industries highlights the key drivers behind the ideologies of Permaculture implementation.

Despite often being overlooked and undervalued, agriculture has written the history books in human settlements, claiming responsibility for developing governmental strategy and driving political decisions (Federico, 2010). Summarising these stages of human and agricultural development, Rostow (1990) insisted 'the revolutionary changes in agricultural productivity are an essential condition for successful take-off' towards a modern capitalist economy (Weis 2010).

Politics, Ideology and Sustainable Development

Klein (2014) suggests agriculture and politics are intwined with the efforts of sustainable development. In more recent years, permanent agriculture has stimulated new horizons for human settlement (Mollison, 1988). Federico (2010) notes the growth of food production has outweighed population increase, off-setting the trend as farming techniques and encroachment on natural landscapes to raise crops has grown. Although the distribution of food, according to average consumption per person, varies drastically at the global level,

Federico (2010) suggests the 'production to consumption' averages have a global yet unequal distribution. As globalisation has grown in accordance with the ever-changing nature of capitalism's drive for profits (Thomas 2007), the global food production trends have trended towards the economic drivers of mass monoculture production, particularly in the nations of the global south. This has assisted in the increasing affluent consumption patterns of the global north, resulting in land grabbing and unregulated primary production. Central to international development, the productivity of industrial capitalist agriculture is responsible for the perverse ecological tribulations associated with the replacement of labour, proficiency and knowledge, with unsustainable technology reliant on disguised external costs Weis (2010).

Dominant to this system is moderately cheap oil, which essentially subsidises the inexpensive industrial grains which fundamentally govern global food security (Weis, 2013; Weis, 2010). Accelerating ecological shortfalls and growth in biofuels has amplified in conjunction with rising demands of livestock feed. According to Sachs (2005, p.36), capitalism's development ladder is based upon defining 'raising agricultural productivity' as 'food production per farmer' and suggests that this is a fundamental root of 'modern economic growth.' Essentially, productivity gains assist the representation of 'enhanced productivity per worker', supporting the decline of the agricultural workforce and production of increasingly cheaper food.

In the midst of ecological breakdown through climate change, Weis (2010) summarises that massive subsidies are decreasing food prices in world markets and encouraging the rise of meat consumption together with affluence This is achieved by causing an 'inverse relationship between a nation's per capita GDP and the percentage of the workforce in agriculture; enhancing yields, most importantly in grains and oilseeds and their conversion to meat, milk and eggs; the aggregate and per capita growth in the global food supply'.

Most importantly, the control of power over decision making in industrial capitalist agriculture is held by transnational corporations (TNCs). Weis (2010) claims that 'the growth and consolidation of agro input TNCs (chemicals, fertilizers, seeds and animal pharmaceuticals) and agro food TNCs (processing, distribution and retailing) dictate options for both farmers and consumers'.

The misleading guise in efficiency of industrial capitalist agriculture, with its foundations in cheap foods has begun to express intense price instability in global markets since 2005 (Weis 2010), however, collective grain, oilseed and meat production have persisted to increase gradually. Despite the environmental deficit imposed on global systems by industrial capitalist agriculture, the immediate influence creating world food price volatility is the impending scarcity of fossil fuels, thus generating vast stressors on supply *and* demand within the global grains and oilseeds market (Weis, 2010). Detrimental socio-economic crises, such as malnourishment for many of the world's poorest countries, have continued to rise as a result of rising import expenses which, conversely, systematically profit agro TNCs (Weis 2010).

Fundamentally, from a non-industrial perspective, the relationship between food cultivation success and failure is explored by both Federico (2010) and Mollison (1988), who relate to soil quality and management for productivity or restriction. This has resulted in the development of varied techniques in different climates and altitudes, such as swidden 'slash and burn' and biointensive composting. In the tropics, Amazonian Dark Earths (ADE), also called *terra preta*, are black, carbon-rich soils associated with biochar of which dating suggests anthropogenic agricultural techniques, such as slash and burn, potentially, heavily influenced the sculpture of jungles of the amazon rainforest, by purposeful cultivation and species dispersal. This is evidenced by the chemical and physical characteristics of soils being unmistakably different from the Oxisols and Ultisols that surround them in the Amazon region (Harden 2010). Constructively, one can envision the potential impacts of anthropogenic influence of soils, by observing genetic diversity in these ecological systems. Ancient swidden techniques, still used throughout South East Asia, evidence how rotational agro-forestry cultivation can sustainably manage forest canopies without total biological deficit and still provide sustenance (Poffenberger 2006).

The development of industrialised monoculture for mass production has seen the rise of machines and chemical inputs into the system, with the replacement of labour and automatic biological functions, resulting in an endless cycle of soil thirst for nitrogen and other crucial compounds (Lowenfels and Lewis, 2010). With the rise of health and environmental awareness however, older approaches, such as organic farming, have more recently experienced rapid growth and widespread acceptance (Lockeretz, 2007).

Klein (2014) suggests governments have the immediate capacity and agency to motivate the world into solutions based upon agenda, the question however, of whether the ideology and politics themselves have an ideology and ethics which inhibits sustainable development of the many issues attributing towards climate injustice such as the agricultural system. The manipulation of agricultural politics is no new concept. Throughout history, the urban production of food has fluctuated in popularity (Hardman, 2012). Interestingly, the governmental support of community food growing or 'off grid living' has seen fluctuation in support over time. In the time of World Wars, governments initiated the national victory garden movement in a 'bid for common goals of liberation, survival and adventure' (Gowdy-Wygant, 2013), assisting allied forces in war efforts and the limited ration diets. In contrast, Hardman (2012) documents the activities of informal urban farmers who challenge opposing governmental limitations for land use, to produce crops on illegally commandeered land throughout urban settings. A system that could potentially be of benefit to the mainstream in light of the global issues, resulting in international targets that have been put in place is Permaculture.

2.2 An Introduction to the Permaculture Movement

Recently, the Permaculture movement has witnessed increasing popularity; drawing the attention of academics, the mainstream media and the public. It can be understood to be a holistic revolution combining science, economics, earth care and people care which has resulted in a worldwide network phenomenon. A definition of Permaculture, as stated by Bill Mollison, co-founder of Permaculture:

> *''Permaculture is the study of the design of those sustainable or enduring systems that support human society, agricultural and intellectual, traditional and scientific, architectural, financial and legal. It is the study of integrated systems, for the purpose of better design and application of such systems. Permaculture is a philosophy of working with, rather than against nature; of protracted and thoughtful observation rather than protracted & thoughtless labour; and of*

looking at plants and animals in all their functions, rather than treating any area as a single product system.''

(Mollison, 1988)

The Permaculture movement has grown in response to the socio-economic and environmental issues which are faced across the earth.Since Permaculture's formal inception in the late 1980s , the principles and ethics of which govern the movement have been applied to multiple disciplines. Permaculture's founders shared broad environmental concerns with the movements of agroecology (Ferguson and Lovell 2014), forest gardens (Crawford, 2010; Weiseman, Halsey, Ruddock 2014), and ecological design (Edwards, 2005). Consequently, they developed disciplines of their own, based around energy scarcity, for energy-intensive agricultural systems (Mollison and Holmgren 1978; Ferguson & Lovell 2014). Permanent agriculture is no recent concept. Tauger (2010) intimates historically and presently, farmers as viewed as 'the most important human interface between civilization and the natural world'.

Ideology of Permaculture: A Design Science

While Permaculture has a principal focus on agriculture, the movement consists of a vision which is not solely restricted to agriculture and provides a framework of systems design, through which more resilient productive societies can function, as shown by Mollison (1998) and Holmgren (2007). It is regarded as a design science, which means:

"Permaculture is about designing sustainable human communities and preserving and extending natural systems. It covers aspects of designing and maintaining a cultivated ecology in any climate: the principles of design; design methods; understanding patterns in nature; climatic factors; water; soils earthworks; techniques and strategies in the different climatic types aquaculture; and in the social, legal and economic design of human

settlement.. strategies for the necessary changes in social investment policy, politics itself and towards regional or village self-reliance are now desperately needed.

(Mollison 1988:i)"

Applied to all dimensions of human-environment interaction in rural and urban, overdeveloped and underdeveloped contexts', (Lockyer and Veteto.) Permaculture is rooted with core values and ethics forming its ideology and principle-based approach.

Since conception, Permaculture has aimed to transform the habits and habitats of humans through acknowledgement of the imbed 'design' of the natural environment and a systems approach to design efficiency (Rothe & Katia, 2014). Emphasized as a stand-alone philosophy, Rothe and Katja (2014) highlight Permaculture design as a radical link of ecological reasoning, practical systems and imagination, thereby, alienated in its own right from environmental science or environmental politics. They suggest that instead, Permaculture draws upon the holistic *Gaia hypothesis*, identifying earth as an intellectual assembly of material which transforms thought processes (Lovelock & Lovelock, 2000), as shown in the regenerative approach of Holmgren (2007).

Gaining global popularity, Permaculture design offers a solutions-based approach to land and resource use which is changing; city planning (Hemenway, 2015); urban development (Vishwam 2014); agriculture (Holmgren, 2007); and, how humans interact with space around them. The development of Permaculture birthed as a direct response to warnings of the crisis of 'peak oil', issued by geologist Hubbert (1972) in 'Limits to Growth.' Mollison aimed to provide a framework for designing and maintaining a cultivated ecology in any climate, through sustainable human settlements which preserve and extend natural systems.

Lockyer and Veteto (2014, p.12), indicate permaculture has given 'anthropologist a methodology for challenging dominant paradigms and constructing alternative bioregional possibilities', with compelling examples of collaborations between anthropologists and permaculturalists where the skills from both domains improve sustainability in communities where they both live and work'

Principles

The replicable model is formulated by 12 principles, which when applied; honour the natural ecological patterns of each space. In his book 'Permaculture Principles & Pathways Beyond Sustainability', Holmgren (2010) defines the twelve principles of Permaculture.

Table 1 The Principles defined by Holmgren (2002)

Principle	***Breakdown***
Observe and Interact	By taking the time to engage with nature we can design solutions that suit our particular situation.
Catch and Store Energy	By developing systems that collect resources when they are abundant, we can use them in times of need.
Obtain a yield	Ensure that you are getting truly useful rewards as part of the working you are doing.
Apply Self-regulation and Accept Feedback	We need to discourage inappropriate activity to ensure that systems can continue to function well. Negative feedback is often slow to emerge.
Use and Value Renewable Resources and Services	Make the best use of nature's abundance to reduce our consumptive behaviour and dependence on non-renewable resources.

Produce No Waste .	By valuing and making use of all the resources that are available to us, nothing goes to waste
Design from Patterns to Details	By stepping back, we can observe patterns in nature and society. These can form the backbone of our designs, with the details filled in as we go.
Integrate Rather Than Segregate	By putting the right things in the right place, relationships develop between those things and they work together to support each other.
Use Small and Slow Solutions	Small and slow systems are easier to maintain than big ones, making better use of local resources and produce more sustainable outcomes.
Use and Value Diversity	Diversity reduces vulnerability to a variety of threats and takes advantage of the unique nature of the environment in which it resides.
Use Edges and Value the Marginal	The interface between things is where the most interesting events take place. These are often the most valuable, diverse and productive elements in the system.
Creatively Use and Respond to Change	We can have a positive impact on inevitable change by carefully observing and then intervening at the right time.

It is important to note, these 12 principles form an orientation map of design for all permaculture applications and activities (Mollison, 1988). They are applied to ecological design efforts, community design and social permaculture. In effect, the principles are

philosophical in nature. As explained by Holmgren (2007), each principle is reflective of natural processes, the patterns and laws observed in the natural world and, together, they contribute to formulate a design science. For example, 'produce no waste'; natural systems produce no waste, as all waste is redistributed back into the system. Interestingly, humans are the only species on the planet to produce waste from their systems.

It is telling that Mollison and Holmgren regulated the proceeding 11 principles with the initial principle: 'Observe and Interact'. This is a testament to humbly absorbing nature's intellect of the interconnectedness of ecosystems, from which human intervention and fabrication could be guided. From observation of Permaculture in practice, identification of natural diverse patterns is focus, providing a foundation for a low energy human support system (Rothe 2014). Morel *et al* (2018) define the most distinguishing aspects of Permaculture design as an agro- ecosystem to be; (1) site specificity, including attention to micro- climate; (2) interaction between components at multiple scales, from field-scale polycultures to agro- ecosystem-scale land use diversity; and (3) spatial configuration as a key driver of multiple functions.

Permaculture Education

Permaculture is adopted by facilitating education through courses and workshops to provide skills, models and philosophies of systems and approaches (Mollison 1988). The fundamental method by which new individuals have learned Permaculture globally has been through two-week long (72-hour) Permaculture Design Certificate (PDC) courses, based on principles and practices defined in the books described above. Established by Mollison at the Permaculture Institute of New South Wales, Australia, the PDC course focuses on the 'construction of human settlements, Permaculture design principles, the study of model systems and hands-on work to implement Permaculture designs on-site' (Scott 2010). The courses feature formulated protocols such as farm layout, soil management, building materials, alternative energy, and human needs such as clean air and water, sanitation, food and shelter (Scott 2010: Mollison 1988). Due to the bioregional nature of Permaculture, the PDC course differs in distinct areas of the world along with regional information, institutions, and strategies for implementing and distributing Permaculture (Scott 2010).

Permaculture: A Holistic Approach

Importantly, it is noted that Permaculture, since its early establishment, has blossomed into an adaptation of its former core attributes and now branches into holistic key domains that require transformation to create a sustainable culture. Holmgren (2007) makes clear, Permaculture is no longer organic gardening, or associated solely with landscape practices, yet covers the skills needed to re-empower people to provide for their needs as individuals, households and communities.

Key Domains of the Permaculture

The evolution of the practice from the principles and ethics, into applying these to categorised domains which deal with physical and energetic resources, as well as human organization, are often called 'invisible structures' in Permaculture teaching (Holmgren 2007). The main domains displayed in the Permaculture flower formation are: 'health and spiritual wellbeing, finance and economics, land tenure and community and nature stewardship, built environment, tools and technology, culture and education', all revolving around the ethics at the core (Holmgren 2007). Initially, the spiral representation of the evolutionary path ascends from the centre of the flower, shown in figure 1, from 'ethics and principles' and meandering through the other domains, starting at the level of 'personal and local' and moving, respectively, towards 'global' (Holmgren 2007). The visual representation in figure 1 gives guidance for this research, emphasising the varied disciplines within the holistic approach and symbolises the overlapping categories of the movement.

A central component of the 'culture' identified by Holmgren (2007) is how people, their buildings and systems-thinking dictate how they organise themselves in line with their design principles. The resultant outcome provides a framework for implementing sustainable culture. Holmgren suggests these skills and ways of living have been 'lost', thus requiring rediscovery, in order to successfully provide for our needs.

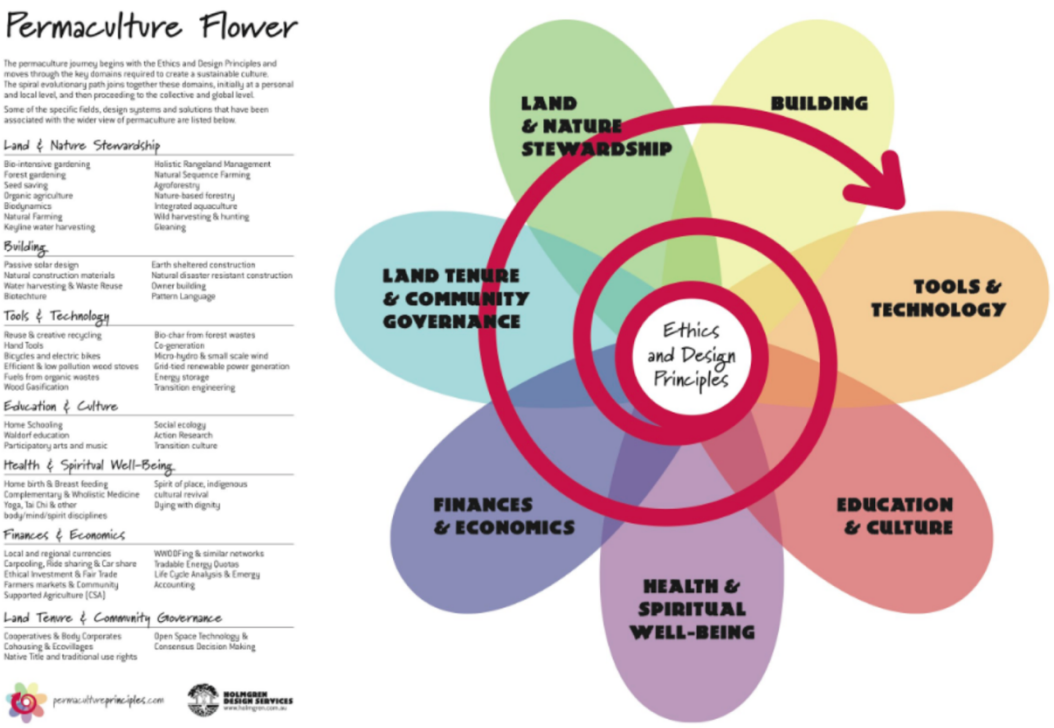

Figure 1: The Permaculture Flower (Holmgren 2007)

The Design Process

The general process of ecological design follows a procedure of first assessing what the needs are, this includes a site analysis (sector analysis) of required and desired *functions*. The assessment of biodiversity, species, topography, soil constitutes, hydrology, and energy input and outputs; such as annual rainfall, temperature, sun aspects, available resources, all of which contribute to the creation of a 'Base Map'. Leading on from this, the ecological and sociological components are charted into a series of layered mapping, either digitally, through GIS and computer-aided software, or drawn by hand. In chapter 4, an interview with D. Halsey explores how the evolution of Permaculture design is advancing into the technological era, to provide professionally detailed ecological design using digital processes.

Zoning: A Key Aspect of Design

The seventh principle, 'design from patterns to details' (Mollison 1988), often translates to organizing the landscape into zones. The use of optimizing zones, based on habitual visits, creates an efficiency model. Generally, areas needing a higher volume of visits (most heavily maintained) are allocated space closest to dwellings and ripple out to wilderness zones which

are minimally managed lands furthest away. In effect, beginning with areas requiring the most human interaction and moving outwards to areas in need of least human interaction. Zone integration aligns components of the Permaculture design with crossover uses, aiming to reduce energy inputs and reduce labour by grouping symbiotic functions (Mollison 1988). Zones are regions of grouped functions and are generally positioned logistically in the most energy efficient location on the site, starting with zone 0 as the main dwelling. Zone 1 immediately surrounds the dwelling and so on (Mollison 1988) with the final classified zone rolling out to infrequently visited or unmanaged wilderness.

In relation to informing policy makers, from a city planning perspective, the zone system can be applied to organize urban distribution of energy. In an example, the University of Guelph: School of Landscape Architecture and Tomlik (2009) conceptualize the applicability of 'Permaculture district planning' by displaying 5 districts, where the central district (zone) represents the area of highest energy input with the least land area, and the outermost district furthest away from human activity. Addressing this ideal, Mohd Salleh et al, (2018) explored the planning and design element of Permaculture zones for land use design, in which it is suggested that zone planning was a beneficial component for efficient energy use, when utilising the knowledge of local people.

Organisational structure of zone placement is also applicable to the organisation of people. In a business, school or non-profit, people can be placed into the organisation structure based on their intensity, involvement and frequency of decision making (Hemenway 2015). Hemenway (2015) goes on to identify the needs of the participants within a community or organisation as being very different, with varying frequencies of contact and intimacy, which are inherently affected by persons within other zones. This component could reform the decision-making process for many organizations and be an avenue of social Permaculture, to be leveraged into mainstream business and policy making.

Hemenway (2015) suggests simple solutions to reduce the carbon footprint of residents, with personal transportation decisions based on journey distance. Logically this suggests, walking in zone 1, cycling in zone 2, public transport in zone 3, automotive in zone 4, and plane, train or ship for zone 5.

The fascinating approach of zone mapping is in its rigorous and diverse applicability to not only physical land planning, but also to social and organisational structures, concluded Hemenway (2015). Learning the principles can assist decision makers in placing components, of any system, in the most suitable arrangement for optimum energy efficiency and yields which now provides an effective opportunity, within organisations and partnerships, to successfully implement design strategy to attain the multinational SDGs.

Forest Gardens: Key Components of Climate Change Strategy with Perennial Systems

Forest gardens are important to explore as they embody the very essence of Permaculture and System's thinking. They are a great metaphor of the practice and its web-like outlook.

Hathaway (2016) states, agriculture uses 85 % of freshwater and, directly or indirectly, produces nearly half of all greenhouse gas emissions. Through research surrounding this statement and exploring the widespread practice of agroecology, it is suggested that Permaculture principles, when applied to agroecology, 'could significantly reduce energy, pesticide, and freshwater usage, while simultaneously restoring degraded soil and sequestering large quantities of carbon'. Addressing these key ecological problems by redesigning agricultural systems to mimic natural succession, perennial systems have emerged into the methodology of 'Forest Gardening' which merits attention for systems designers.

What is a Forest Garden?

> *"A forest garden is a garden modelled on the structure of young natural woodland, utilizing plants of direct and indirect benefit to people- often edible plants".*
>
> (Crawford 2010, p.1)

In Wenlock Hedge, Shropshire, the world of Robert Hart explores the pioneering concept of temperate forest gardens, of which has only a short yet effective history of around 35 years (Crawford 2010). Although formalised temperate forest gardens are documented as recent, Poffenberger (2006) describes the method as a key component of evolution of forests throughout South East Asia. In the temperate macroclimate, described by Hopkins in 'Creating a Forest Garden, Crawford (2010) has created the closest to what is imagined as the 'Garden of Eden'. Using a three-dimensional jumble of trees and shrubs, Hart developed an intelligent food system, inspired through re-imagining a whole new agricultural system. The magnitude of edible diversity in this arrangement has stimulated and further inspired thousands of gardens around the world, not only for yielding fruits, but also sequentially locking more carbon into the ground than emitted (Crawford 2010).

Interestingly, in direct correlation, the current question for agriculture is 'how do we move towards sustainable, diverse, robust, perennial based, no till farming, whilst building soils and not destroying them and locking carbon in as storage?' (Jacke and Toensmeier 2005). Continuing Hart's stimulus, Crawford, of Devon UK, distils the method of agroforestry into a complex layered forest garden system (Crawford 2010). In Crawford's carefully designed ecosystems, the self-fertilizing structure utilizes nitrogen fixing plants and dynamic accumulators, to create effective nutrient cycling to stimulate vital elements into the subsoil (Crawford 2010:5). Importantly, the concept Is designed with the scale of canopy climax spacing in mind and is documented to be adaptable to most environments, be it a small back garden in an urban setting or a large poly culture biome (Crawford 2010). The effective use of forest gardens is seen throughout tropical biomes of South East Asia where indigenous forest management, through agriculture, grows multiple crops within a forest system (Poffenberger 2006).

In science, gardens of this nature are referred to as 'Multistrata systems', of which are commonly known in tropical Asia, Africa, Central America and temperate to subtropical China (Jacke and Toensmeier 2005; Crawford 2010). The benefits of a system operating between orchards and natural woodland are generally described by Jacke and Toensmeier (2005); Crawford (2010):

- Working with nature rather than against

- Low maintenance and high efficiency
- Wide range of products or yields
- High nutritional value
- Resilience to climate extremes
- Biologically sustainable
- Aesthetically beautiful

Yields from the forest garden system include a wide variety of products such as, 'nuts, fruits, vegetables, salad crops, seeds, herbs, spices, firewood, mushrooms, poles and canes, tying materials, medicine, soap plants, honey, sap and resin' (Crawford 2010). Defining the biological efficiency of the forest garden system, energy outputs over energy inputs are dictated as highly efficient due to their low input nature. In such unpredictable climatic times, forest-based systems are documented as the most resilient ecosystems in adverse weather conditions, due to their genetic and structural diversity (Crawford 2010).

Commercial Potential

Distinctly, forest gardens throughout the world carry commercial potential (Poffenberger 2006), generally from one or two main cash crops, however, with this approach, the importance of biological diversity is both respected and efficiently managed. The added benefit of cultivating genetic diversity is the potential for 'Insurance crops' which may not be the primary harvested yield but are available in times of need as a bumper crop (Crawford 2010). In a case study by Poffenberger (2006), the lucrative forest garden approach used in Java facilitates the production of up to 200 edible crops - all with high earning potential.

Summary of Forest Gardens

Evidential methods of alternative agriculture, such as forest gardening, shown by Crawford (2010) offer hopeful interceptions within the agro-sector, to not only answer the looming global food security issue, but also sequester carbon in a bid to stunt climate change. Evidential methods such as agroforestry and forest gardening, also documented by Poffenberger (2006), merit firm enquiry of policy makers who are seriously addressing climate change.

Permaculture: Local to Global

The term 'Permaculture' was conditionally reserved for affiliated graduates of the Permaculture institute programs (Mollison 1988). Globally, a main directory for practitioners, teachers, and projects, capable of using the permaculture label, can be found in online communities (Permaculture Global 2019, retrieved from, www.Permaculturegloba l.org), of which there are 20339 individuals and 2567 projects registered, although this is not to take into account the countless unregistered projects and individuals around the world.

Figure 2: Global registered Permaculture projects 2019 (Permaculture Global 2019, retrieved from, www.permaculturegloba l.org/projects)

Figure 3: Global distribution of registered Permaculture personnel 2019 (Permaculture Global 2019, retrieved from, https://permaculturegloba l.org/users)

Mainstreaming the Local to Global Permaculture Movement

Initially Permaculture was developed as a grassroots movement, with aims to transition to sustainability and regenerative practice models (Ferguson and Lovell 2015). Although Permaculture is now widespread, Ferguson and Lovell (2014) identify the lack of reference to contemporary science, such as models most closely related including, but not limited to, agroecology and agroforestry. This has led to an isolation of the concept. Ferguson and Lovell's (2014) review of Permaculture literature explores two viewpoints, one 'assigns the blame for this isolation to the inability of scientists and institutions to comprehend or appreciate the radical proposals put forth by Permaculture' (Mollison and Holmgren 1978; Mollison 1979, 1988; Holmgren 2004; Shepard 2013), which is evidently observed in the discourse of Permaculture actors. The second, is the concerning effects of prolonged scientific isolation voiced as a 'lack of awareness, in the Permaculture literature, of contemporary developments in relevant science, the accompanying persistence of idiosyncratic or misleading terminology, and the potential for influence of pseudo-scientific theories'. Continuing with Biolimetric analysis, performed by Ferguson and Lovell (2014), they suggest this trend of scientific isolation may be changing, as evidenced by the emergence of more progressive research publications.

Due to the rapidly changing policy making context, 'evidence based' concepts closely linked to Permaculture such as agroecology, are useful due to the density of findings from the diversity of implementations. Agroecology has already been regarded as a scientific discipline in recent decades but, according to Krebs and Bach (2018), it is only recently that 'design principles for the reorganization of farming systems have been formulated, whereas Permaculture practitioners have long been using design principles without them ever being scrutinized'.

Ferguson and Lovell (2014) suggest radical proposals are not always the victims of scientific exclusion which is often claimed throughout Permaculture literature. They support this viewpoint with the example of 'replacing annual staple crops with perennial grains in diverse prairie-mimic polycultures', which was received openly by the scientific community due to its grounding in empirical science (DeHaan et al. 2005; Cox et al. 2006; Glover et al. 2010; cited by Ferguson and Lovell 2014).

Ferguson and Lovell (2014) explain that contrary to other specialist areas within scientific research, Permaculture has only recently found its way into academic investigation, despite its emergence from an academic collaboration between professor (Mollison) and student (Holmgren). In a study by Ferguson and Lovell (2014), only 230 conventional academic type publications on Permaculture were recognised 'including conference proceedings, books, periodicals and graduate theses'. The implementation of Permaculture as an evidence-informed policy and practice pathway remains vastly unexplored. This is identified by Ferguson and Lovell (2014) in that, 'scholarly work on Permaculture, from more closely related disciplines, is often marked by sparse citations of relevant scientific literature'.

On this note, Akhtar, Lodhi, Khan and Sarwar (2016) state, 'Conventional sustainable resource management systems are based on a neoclassical economic approach that ignores the patterns in nature and, therefore, are not actually capable of sustainable management of resources', suggesting the integration of the 'philosophy of Permaculture with strategic management' could develop a 'pragmatic tool for policy development' for sustainable ecological resource management.

Barriers to the Spread of Permaculture

The main discourse of Permaculture actors for the distribution and impact of ecological development solutions using Permaculture design principles are:

- *'Prevailing scientific culture of education Is cautious, if not hostile, to holistic methods of inquiry.' (Holmgren 2007, p.3).*
- *Power of global TNCs governance over world-wide agriculture (Weis 2010, p.3).*
- *The dominant culture of consumerism driven by dysfunctional economic measures of well-being and progress.' (Holmgren 2007, p.3).*
- *'Political, economic and social elites (both global and local) which stand to lose influence and power through the adoption of local autonomy and self-reliance.' (Holmgren 2007, p.3) also inferred by Weis (2010).*

In addition, the absence of academic literature critiquing this topic could support claims by Holmgren (2007), who, directly, outlines the conflict between Permaculture and the 'culture of consumerism' which drives the current global economy. The result of which is caution around scientific enquiry into the movement. Weis (2010) outlines how TNCs governance over the worldwide agricultural industry, through multiple revenue streams, holds a firm grip over market shares and farming practices. Weis (2010) also draws attention to the dependence of farmers upon TNCs for seed and synthetic inputs related to the oil industry. Increased education and awareness may provide hope for mitigating this dependency.

Permaculture Activities and Connected Impacts

Although emphasis through policy and development leans towards sustainability, Rhodes (2015) highlights the flaw within this direction, due to energy loss within a system and surmises that it never quite achieves total sustainability. In response to the debatable term, 'sustainable', Permaculture, over the past two decades, has explored activities connected with environmental and social 'regeneration' (Lockyer and Veteto 2014). Interestingly, Fox et al (2006) suggests that, despite scientists recognising biodiversity loss as holistically interconnected with anthropogenic influence of ecosystem degradation, their occupations are usually segregated into environmental sciences such as conservation genetics or the social sciences. As a result, this rarely adopts the necessary dexterities which are available from embracing other specialists, which would assist in broad-spectrum, high impact solutions.

Fundamentally, movements orchestrated by organisations such as Permatil, a Permaculture support organization in Timor Leste, provide solution focussed approaches to education "to help families and communities become more resilient, sustainable and productive, not just to survive but to be able to reach their full potential and thrive"(McKenzie and Lemos 2018). The merging of social science tools, with environmental knowledge through a common language, is a crucial missing factor in conservation, emphasised by Fox et al (2006). Identified in the '*Tropical Permaculture Guidebook'*, Mckenzie and Lemos (2018) refer to the importance of accessibility, with the aim of providing information to improve basic wealth for all people, covering the environment, the trees, the animals, vegetables and grains

and appreciating the wealth of people and their knowledge. The guidebook is inclusive in its delivery; designed for farmers, community groups and their members, agriculture and university students, NGOs, government workers, Permaculture trainers and practitioners, demonstration sites, businesses, cooperatives, schools, and, importantly, school students.

In 2014 Permaculture Research aimed to build evidence to improve Permaculture practice. The project aimed to focus on organising a network of academics and practitioners to facilitate collaboration and support people in the sharing of research (Goldring 2014). Conclusively, Goldring (2014) identified the 'lack of systematic documentation for monitoring local projects', which can be incorporated into the Permaculture design process.

Conversely, in other domains, the efforts of Permaculture endeavours and impacts have had partial documentation whereby efforts have; improved pest control in ecosystem services (Kranz, Wolz and Miller 2019); supported food distribution and food security (Halsey 2014); and, holistic peace- building by addressing war-induced environmental damage and post conflict structural violence (Felix-Romero 2010).

Lockyer and Veteto (2014), indicate permaculture has been used to address a range of complex issues in a variety of cultures such projects in Nepal, where tackling poverty is addressed with demonstrations, educations and the distribution of resources, such as plants and seeds. Other examples documented by Lockyer and Veteto (2014), include utilising anthropological and indigenous knowledge to regenerate ecosystems in the Shipibo communities of Peru, which combines design principles with local knowledge systems and skills. The result enabled a birthing of a committee of Shipibo families who continuously manage the project and developments, at the same time as production raises and input decreases with a fifteen-fold profit in income.

2.3 Permaculture in Context: Urbanisation

Despite the benefits of urbanisation providing access to healthcare, sanitation, and secure nutrition; Godfrey & Julien (2005) suggests the reality of these habitats display overcrowding, pollution, social deprivation, crime, and stress-related illness. These issues have far-reaching effects upon general health, with less developed countries suffering from 'western' diseases

which have been triggered by colonial urbanisation, including but not limited to, hypertension, heart disease, obesity, diabetes and asthma.

Urbanisation is a global phenomenon; however, the Asia-Pacific region has recently recorded significant urban density development, due to rapid economic growth (IMF 2014), which is home to over 4.2 billion people. Throughout the Asia-Pacific region, Akenji et al (2018) acknowledge there has been an understandable desire for improved living conditions associated with urbanisation. Consequently, the region became the global leader of consumption of primary resources in 2005 (Schandl & West, 2010). Unfortunately, although there may appear to be short term benefits in the guise of development, urbanisation and population growth threatens the longer- term forecasts for continuous affluence and wellbeing. Long term effects cause degradation with extreme amounts of pollution to water, soil and air, creating huge health and social costs, with additional adverse effects towards economic activity and industrial production (UNEP 2016).

The driver for rural dwellers to relocate to urban settings in search of work and improved living standards is Identified by the FAO (2018), where it is suggested individuals living in rural areas are most affected by poverty; yet simultaneously, are fundamental in the problem-solving process, due to their direct involvement in agriculture. This is necessary to overcome the food security task (IFAD 2019. Retrieved from www.ifad.org: WFO 2019). This observation linking both the rural and urban human settlement settings exposes a critical uniqueness of using Permaculture principles in a range of arenas, whilst encompassing a blueprint for regenerative decision making.

Conflicting with mass rural migration to urban locations, the key realisation of policy makers throughout Asia, over the past 30 years, has acknowledged the importance of rural forest dwellers and their influence on forest management (Poffenberger 2006). Effective rural land management is suggested to have direct impacts on urban spaces, as shown in such cases as the Jakarta brownout floods. Here, the act of deforestation adversely affected the city (Poffenberger 2006). Following the chaos that ensued, policy makers have been redirecting their attention towards empowering guardians of forests and associated economic, environmental and cultural figures (Poffenberger 2006). This is echoed within Permaculture as earth stewardship.

Exponentially increasing population densities and an ever-increasing demand for resources provides a major issue for sustainability, as pressure escalates to understand the urbanisation process and its correlation to climate change. In relation to this complex system, Seto and Reenberg (2014) emphasise the requirement of a holistic understanding of the attributes and contributing factors of urbanisation, such as 'natural resource use, socio-demographics, health, and global environmental change'. In a similar context, despite the variety of definitions of 'urban', it is not accurately identified through adopting one subset perspective and requires many approaches to understand the phenomenon in its complexity (Haase et al 2018). Although multifaceted, urbanisation requires food systems to sustain and grow; this requirement is driving relationships between humans and food production, along with the delivery and consumption of nutrition and, fundamentally, is a foundation of Molllion's (1988) theories on human settlement.

Crucially, in '*Introduction to Permaculture'*, the notion of urbanisation was projected in a chapter solely focused on Permaculture design for urban areas (Mollison, 1991: Scott 2010). Spaces are, again, optimised for multiple yields, as an answer to the associated problems with population densities, society structures and food production. Interconnected with the influx of people obtaining residence in urban environments, the solutions develop two-fold. Solutions for Urban Permaculture (Hemenway 2015), to reduce poverty, environmental stress and create social communities are to be achieved while, concurrently, supporting rural communities who choose to remain rural (IFOAM 2019).

This provides the opportunity for Permaculture in practice to facilitate and stimulate opportunity and development for rural communities, through promoting self-sustainability, thereby mitigating the pressure for land custodians to migrate into urban environments. Mitigating this pressure takes into account existing frameworks such as Ecosystem Services and the principles guiding policy makers, such as 'Promote societal choice using transparent and equitable processes and tools', by supporting stakeholders of land tenure to be more effective at upkeeping national and domestic environmental goals.

Despite rapid urbanisation contributing to climate change, many of the opportunities presented to national policymakers for reducing GHCs have revolved around the food system. Niles et al (2018) discuss the topic of urgent climate change mitigation suggesting, 'Public

policy will play a major role in driving change toward a lower food system GHG footprint in balance with other goals for food systems.' This gives strength to the fundamentals of Permaculture which aim to reduce food miles with more localised growing systems. These systems can be adopted in any environment including urban areas, as inferred by Holmgren (2007). This is to be seen as an important factor in the quest for solutions to enable continued expansion of urbanisation and structure. This should also be taken into account when addressing the warnings summarized by Niles et al (2018); 'complementary actions such as stronger regulatory and fiscal incentives, including food taxes, particularly in industrialized countries, mandatory industry standards, renewable energy subsidies and controls on land use change' (De Pinto et al, 2016; Mason and Lang, 2017; Springmann et al, 2017).

Permaculture in Context: Food Security

Importantly, Permaculture translates to 'permanent agriculture'. One of the core solutions Permaculture offers is 'food security'.

> *"Food security is fundamentally about achieving reliable access to adequate, affordable and nutritious food supplies sufficient to avoid chronic hunger, crisis hunger and stunted development".*
>
> (Johnson, 2009, p.4)

It is important to assess the risk and reasoning of people not having access to food which would enable them to lead a healthy lifestyle (Von Brauen *et al*., 1992). The concept of food security has been around for over 40 years, originally, the shift in importance from short term to long term food planning was a key significant turn (Anderson and Cook, 1999), stemming back over 40 years. Food security is a fundamental building block of Urbanisation (Satterthwaite, McGranahan, Tacoli 2010) which encompasses population change, mobility problems, international trade concerns, climate change and many more complicated issues (Phillips, 2009). The foremost concern remains as to whether food production can keep up with population growth (Enrlich *et al*., 1993). Assessing population growth trends foresees a jump towards 9 billion people by 2050 (Hardman 2012); with growth predicted to affect developing countries most. Food systems are predicted to be under immense strain to

support such growth, requiring mass scaling of production by around 70% (FAO, 2009). Having said this, net production is not currently the core issue, as production outweighs capita at an average of 2600 calories per person being produced globally.

The dispute sits with food distribution systems, in order to provide more food to disadvantaged populations (Hanson *et al.,* 2012; Johnson, 2011). Around 70% of UK food is imported from abroad; causing international organizations to formulate strategies to alleviate the issue of food security, According to DEFRA (2002). The political risk of relying so heavily on food imports was discussed by Gowdy-Wygant (2013). Gowdy-Wygant gives a historical account of the conflict tactics of the German forces during World War 1, which prevented imports into the UK by blockages and sabotage, in an attempt to starve the British to defeat. To counter this, the British government invested in a surge of political propaganda, heavily focused on growing food, headed by the term 'Victory Gardens'. This was a contributing factor to the success of the allied forces victory, as the nation rallied to raise crops on farms, vacant lots, in backyards, rooftops and window boxes (Gowdy-Wygant 2013).

The complexities of formulating coherent strategies across international, national, regional and local domains becomes apparent when viewing the SDGs and modes of tackling food systems. The UK national strategy aims to bring all of the local plans together, with the aim to achieve 'better integration of food policy across Government' by a date of 2030 (DEFRA, 2010: 4; Hardman 2012; Marsden, 2010). As a consequence of potentially exiting the EU, this is ambiguous and an increased demand for statistics in areas such as food and food trade are a key driver of the way new policy evolves for the Agriculture Act (DEFRA 2018). In contrast, the leniency, and lack of urgency, from the United Nations Food and Agricultural Organisation (FAO) is planning for 2050, despite national SDGs' target of 2030.

Despite technological advancements providing cheap food to millions, Donald et al (2010) explore re-regionalizing the food system in response. This is in response to broadly held concerns that the 'conventional agro-industrial food system has not efficiently provided a 'nutritious, sustainable and equitable supply of food to the world's population,' and continues to harbour problems such as soil and water depletion, food safety scares, animal welfare, declining rural communities, rising obesity and diet-related health problems, as well as growing food insecurity (Donald, et al 2010). Despite political commitments, the balance of

power lies with corporations. Nabby (2011) explains that corporations will largely dictate food security and the future of food.

Donald et al (2010) had previously described debates about justice in the food system, with reference to the lack of structure in rationalised food systems. This is unlike national supermarkets, which are well equipped with robust structures. Larger supermarkets can be viewed as a key barrier to re-regionalisation. Nabby (2011) goes on to suggest a revamp of the 'legal, institutional and biotechnical mechanisms' in order for the poor to survive. Where gaps emerge, Hardman (2012) emphasizes the role of nonprofits who provide services where principled governance fails. Hardman (2012) publicises the work of various non-for-profit organisations which tackle unproductive spaces and niches within the free market. These include the Community Land Advisory Service and the Federation of City Farms and Community Gardens (FCFCG), who facilitate food production in urban cities and purposefully target areas which severely lack food infrastructure and supply (Community Land Advisory Service, 2012; FCFCG, 2009; Viljoen, 2005). Subsequently, the rise of social 'guerrilla gardening' acts have rippled across the globe which is an informal urban agriculture initiative and is, often, viewed as being in 'defiance' to existing structures of power within food production (Hardman, 2012). Although it can be seen to have a 'rebellious attitude', it has been shown to be communally relatable and a motivating force for change. Driven by food security and autonomy, guerrilla gardening approaches issues to food scarcity boldly, although, in some regions, their methods are illegal.

Permaculture: A Global Outlook

Through a political lens

Permaculture, when observed through a political lens, suggests that 'System optimization [seeks] to identify strategic points of leverage, where minimal intervention may enhance the performance of the desired functions of human social ecosystems beyond that of naturally occurring systems' (Morel, Kevin & Léger, François & Ferguson, Rafter 2018). Mobilizing local movements, Hopkins' 'Transition Network' (https://transitionnetwork.org) has rapidly grown

more than 500 post petrol initiatives and promotes collective approaches to human settlement (Hopkins 2008). In support, Suk (2014) calls for 'more aggressive environmental-policy measures that support Permaculture and 'internalise the non-market value' of reduced fossil-fuel energy consumption and waste recycling'.

In a similar context, the WFO (2019) expressed their apprehension over the effects of globalization, as farmers are converted into the subcontractors of raw materials production, thus leaving less room for autonomous farmers, who may long to return to regenerative practices. In answer, Suh (2014) suggests that future Permaculture movements should focus on revitalising the community spirit of traditional and existing farming villages, instead of building new intentional communities and/or communes. This approach takes a more transitional stance which supports farmers by allowing for the redesign and purpose of systems already in place.

Akenji et al (2018) emphasizes the key to sustainable transformation, through the lens of SDGs, is achieved by focussing on the 'big picture' or macro, avoiding further digression in the interests of the development of ever narrower and disaggregated data and indicators. Similarly, Akenji et al (2018) support broad-focused policies which influence a variety of goals simultaneously, which may assist to encourage sustainable development in a more integrated manner. Core policy decisions aim to bring about economic transformations, yet sustainable consumption, resilience and biodiversity are, currently, in contrast to traditional means of economic development, whereby the environmental basis for human well-being are, arguably, undermined (Klien 2014). This is seen, particularly, in relation to the posing vulnerability induced by climate change and its costs; food, energy, and water insecurity; unsustainable production and consumption; and deteriorating health and rising costs from air and other pollution (Akenji et all 2018).

A Geographical Comparison between the Global North and the Global South

The 'developing' world awaits infrastructure, with the expansion predicted over the next 30 years, and would merit the adoption of sustainable infrastructure and comprehensive investments to support sustainable industries (Klien 2014), such as regenerative agriculture,

rather than to less progressive typical forms of non-sustainable industry. This opportunity, coupled with SDG frameworks, calls out for alternative sustainable development models. Permaculture is one way of satisfying multiple goals in line with this thinking (Mckenzie and Lemos 2018).

Global North countries are likely to have a stage of 'dirty development' associated with the transition, however, Global South countries may 'leapfrog developed nations' while 'minimizing the environmental costs associated with traditional development, whilst accelerating the benefits of clean development' (Akenji et al 2018), which can be seen in progressive nations such as Costa Rica. It is proposed by Akenji et al (2018) and Mollison (1988) that a lack of such progressive investments has the potential to surpass the earth's capability to upkeep global human well-being, moving forward.

In developing countries, where SDGs are under scrutiny, the lack of literacy proficiency can present obstacles to learning (Mkumbo 2016). In response to this issue, Permaculture-training manuals (McKenzie and Lemos 2018) address the complexities of ecological design with easy to digest guidebooks, adapted with sketches and comprehensive information. Although Mollison and Holmgren (1988) provided mass detail in the early texts, there has been a need for integration of key concepts into alternative texts, mediums and resources aimed at biome specificity and localised literacy capabilities.

In light of the challenges faced by farmers of the global south, it is evident that the dependency upon external inputs is prominent and there is a lack of self-reliance, especially, on a local level. This is stated by the WFO (2019) and listed below;

Most important challenges to international agriculture sector stated by the WFO (2019)

- *Declining added value for farmers.*
- *Low producer prices.*
- *Increased costs of living while incomes of farmers are decreasing.*
- *Lack of access to land caused by high prices and an increasing demand for farmland by non-farmers.*
- *Weakening involvement from farmers, particularly rural women and youth, into decisions making at all levels.*

- *Volatile prices and market fluctuation along vulnerable food-chains and increased vulnerability caused by climatic changes.*
- *Lack of access to knowledge, advisory services and technology.*
- *Ageing farming population due to better opportunities for young people in other professions.*
- *Dependence on investors, traders and processors.*
- *Uncertain property rights and, therefore, no access to financial services, e.g. credits and production inputs.*
- *Little focus upon the empowerment of women, who play an important role of food production.*
- *Corrupt politics and governance.*

The World Farmers Organisation recognises farmers from around the planet experience many shared challenges. Predominantly, it is imperative to obtain fair proceeds from farming commerce, yet livelihoods in rural areas are often poor compared to urban masses, accounting for '75% of the world's poorest people whose food, income, and livelihood prospects depend directly upon agriculture' Ferris *et al* (2014). When profitability in agriculture is missing, young people look for prospects outside of farming and are forced to leave rural areas behind. It is an international and complex task to motivate and assist the admission of young people into the agronomic sector. The contemporary situation leads to an outlook that lacks the necessary specialists who have the competency to create quality food, which iterates the dire need for education in regenerative agriculture. Additionally, price instability and political uncertainty result in low investment in innovation for production growth (WFO 2019).

In response to this need, Permaculture educators have trialled delivering the Permaculture design course in many developing nations, to form a route to regenerative agriculture education, however, the conveniences and urgency of land stewards to dedicate time to new teaching can be difficult.

One such case can be seen in Kenya. Hockin-Grant, Kenneth, Asué and Maï (2017) emphasize the importance of 'fostering feelings of autonomy' by competent, direct, reciprocal communication between NGOs and project participants of Permaculture education, to

strengthen resilient agro-ecological systems. Fundamentally, they conclude the 'needs' of participants are not being met by Permaculture community projects who hadn't previously completed a Permaculture Design Course. They highlight that participants without Permaculture training (PDC) felt frustrated by the limited immediate economic benefits and conflict between Permaculture and their more traditional, local-specific values. However, graduates of the PDC developed more of a 'comprehensive understanding of permaculture, felt empowered and frequently related permaculture to their own traditional cultural values', Hockin-Grant, Kenneth, Asué and Maï (2017, p.1)'. This evidence supports the effectiveness of the PDC, for assisting cross cultural discourses and mitigating conflict through misunderstanding.

Throughout the global south, support regarding food security, nutrition, and the role of women as both mothers and farmers, has attained intense attention from organizations such as IFOAM. In recognition of the challenges faced by this demographic, and what considerable influence women and children have on sustainable development, international policy has fixed its agent on rectification (IFOAM 2019). The distinct requirement for policy evolvement and financing to aid the process of equality in land ownership, stewardship, sustainable cultivation and management, is stressed in the WFOs strategies. In rural areas, numerous organic agriculture programs are instigated such as the 'Nutrition in Mountain Agro-ecosystems' implemented in Nepal, India (Himalaya); Pakistan (Hindukush); Kyrgyzstan, Tajikistan (Pamir and Tian Shan); Ethiopia (African Highlands); Peru, and Ecuador (Andes). Established in 2015, a platform for rural services providers, unites more than 1500 users in the (MAAN) global mountain agro-ecosystems action network (IFOAM 2019).

The fundamental power inflicted by International capitalist agro-food TNCs over market manipulation, has detrimental effects over both the global north and global south (Weis 2010). The consolidation of agro-input TNCs has particular power over a populations' dietary desires, through the nurturing of 'strong brand loyalties. This transforms food into highly branded, packaged and de-spatialized commodities; whereby, 'de-spatialized' refers to the removal of food from its natural context and dietary desires are disconnected from more natural and traditional contributing factors such as time, space and culture, season and landscape (Weise 2010). As a result of this dislocation of context, for example, supermarkets stock ever increasing animal-based products (Weis 2007). The influencing power of TNCs

orchestrates higher import taxes over countries of the global south, channelling the production of cheaper grains and bio-oils to support the livestock industries (Weis 2010). The complex issue is holistic in nature, requiring a shift in dietary consumer trends, which would allow the nations of the global south to re-focus crop selection and agricultural methods (Weis 2010).

Permaculture aims to address the issue of the small holder's dependency systems, linked to oil subsidies, due to the looming peak oil crisis outlined by Hubbert (1972) of which Mollison (1988) and Holmgren's (2007) core formulations rest so heavily. The focus of Permaculture within the global south and global north differs in terms of applicability, yet similar issues are associated with the movement, such as access to land, economic viability, crop selection and cultural influences, however, societies interactions with the environment, as a whole, are heavily influenced by capitalism (Veteto and Lockyer 2008). This is inferred by Lafferty and Eckerberg (2012) in their discussion of Agenda 21; encouraging localised reliance as being, generally, a means to incorporating different conditional modes of social, environmental and economic commitments to sustainable living practices;

> "*It must be assumed that local communities will vary considerably with respect to which aspects of the action plan are most relevant for moving the community towards more sustainable development. Conditions of regional location, geography demography, and most importantly the local economy with all affect interpretation and application of the plan".*
>
> Lafferty and Eckerberg (2012, p.4)

Guiding society towards sustainability, Gray (2007) draws heavily from Agenda 21, supporting the philosophy of combining bioregional principles with ecological modernisation theory, which organises communities around naturally defined regions, while engaging globally and localising production and consumption to regulate a desired accountability.

Within the global north, one such case showcasing the successful mobilisation of localisation is the 'Transition Town movement', particularly, the 'Incredible Edible' food growing revolution, in Todmorden. Walhurt and Dobson (2014) record the radical acts of growing food in public spaces, for everyone to share 'propaganda planting,' in a bid for the community to

take back control of the town's downward spiral in energy and economics. The mobilisation of community food gardens has drawn international attention, after transforming every aspect of the town's life. Warhurst and Dobson (2014: xv) recognised the fundamental need for a 'common language' to create a mass movement towards localisation. The language had to be irrelevant of cultural background or circumstances, which pointed them to the one unifying factor between communities: food. The endeavours in Warhurst and Dobson (2014, p. xiv) suggest two main projects which show successful applications, outside of general 'public planting,' to a town's unused land. The two pilot projects are documented as the 'Incredible Farm', a beyond organic community farm which uses Permaculture and agroforestry core principles and methods, and the 'Incredible Aquagarden' which utilised technological advancements in Urban Agriculture to produce food, such as aquaponics and hydroponics (Warhurst and Dobson 2014, p. 237).

On the search for variables between the Permaculture movement found in the global south and global north, the understanding of 'global-local linkages, shifts attention to the overlooked small-scale place-based, yet firmly networked' assembly of actors (Liftin, 2009, p. 125). Litfin proposes that these actors are pioneering ecologically sustainable ways of living, which results in a bridging of global north and global south labelling. Litfin (2009) acknowledges one such Permaculture related movement, which aimed to dissolve boundaries of the global north and global south categorisation and political classifications, by formulating a stringent network throughout the global ecovillage movement as a holistic knowledge community. Subsequently from 1995, the establishment of the 'Global Ecovillage Network' (GEN) linked thousands of these communities around the commitment of sharing information about sustainable living practices (Litfin 2012). This dissolved limitations between nations and aims to mainstream a subculture of alternative living.

> *'Network members include large networks like Sarvodaya (11,000 villages applying ecological design principles in Sri Lanka) and the Colufifa network of 350 villages in Senegal; the Ladakh project on the Tibetan plateau; ecotowns like Auroville in South India and the Federation of Damanhur in Italy; small rural ecovillages like Gaia Asociación in Argentina and Huehuecoyotl, Mexico; urban rejuvenation projects like Los Angeles Ecovillage and Christiania in Copenhagen; Permaculture design sites such as Crystal Waters, Australia,*

Cochabamba, Bolivia and Barus, Brazil; and educational centers such as Findhorn in Scotland and the Centre for Alternative Technology in Wales'.

(Litfin, 2012, p.130)

Liftin (2009, p. 125) suggests that the 'collective efforts toward self-empowerment' are in response to 'the life-alienating forces of technocracy, the administrative state and global capitalism; an overwhelming factor to land use decisions made by farmers and society worldwide (Weis 2010).

Communication to Bridge Domains

In social psychology and political science, van Dijk and Teun (2002) explain 'ideologies consist of a specific kind of ideas, belief systems or social representations of some kind (Aebischer, Deconchy and Lipiansky, 1992; Augoustinos, 1998; Farr and Moscovici, 1984; Fraser and Gasket 1990).

From a group perspective, this means that they are not solely "personal beliefs, but beliefs shared by groups with sociocultural shared knowledge, group attitudes or norms and values (Van Dijk and Teun 2002) which formulate cultural identity. In relation to the movement of Permaculture, the theme of ideology, whether perceived as positive, negative or neutral, can be identified as a set of ideas. In any culture, it is recognised, intercultural communication through individual participants' discourses may not successfully interpret the intentions of others, due to culturally structured differences in discursive frames (Scollon 1996).

Van Dijk and Teun (2002) inspire a viewpoint, that a significant component to the enquiry of 'how Permaculture could be mainstreamed' may lie in the complex issue of Identity in discourse, which relates to how participants within the social movement represent intentions across cultural boundaries. The identification of policy makers, and the many participants within the Permaculture movement, suggests that each belong to very different discourse systems. Potentially, allowing the perceived inability to successfully interpret one another. Although participants of the movement of Permaculture identify with shared beliefs or

ideologies around their subject area, inevitably, other cultural attributes such as religion, country of residence, gender, and so on, may vary greatly when representing the social identity of Permaculture.

Despite sharing social identity status, based on Permaculture values, the topic of discourse identity in intercultural communication merits vast amounts or research. Scollon (1996) draws attention to the consideration of public discourse when a large number of people are involved in a narrative, claiming that the responsibility lies with a committee, 'who's communicators represent the principal discourse'. In the context of this research, it is acknowledged that intrinsic differences between cross cultural individuals both exist and are endemic. Simply put, the identity representation of Permaculture, in a similar vein to Scollon's (1996) analogy of 'actors within a government', may vary from person to person despite the principles being specifically stated by Mollison (1988), due to the individuals perceived interpretation of the discourse set out by the founding texts entwined their own individual perceptive makeup.

For this reason, the acknowledgement of the complexities involved in Permaculture's role in sustainability, and its adoption and application by policy makers relies heavily upon the accurate representation of the movement through its actors. Yet, Ferguson and Lovell (2014) suggest claims have been historically based on the qualitative interpretation of participants and not through quantitative data sets. This conflict between quantitative and qualitative informed policy is a fundamental issue when inferences are often made by individuals from different discourse systems attempting to negotiate, on which this research postulates.

Bridging Systems

Addressing the transition into mainstreaming regenerative action and identifying existing frameworks, and toolkits which may complement shared agendas, could yield highly beneficial results. Specifically, through the Permaculture lens, it is vitally important to understand policy frameworks at the global and domestic level, so as to propose cohesive

strategies of action. Discussed from the macro perspective, the main policy frameworks presented are, the UNSDGs which answer the questions ''who are the respective stakeholders directly linked to agriculture policy, such as the 'Major Farmers Group'; Why now?' and; 'what are the frameworks used to attain the specific goals within the agendas?'

Another important consideration whilst identifying how Permaculture can meet the requirements of sustainable policy is, 'how do policy makers formulate strategy?' Exploring this topic identifies some of the 'language and toolkits' used by policy makers, which is crucial for formulating a case for Permaculture as a complementary method. Within the agricultural sector, tools such as 'Full Cost Accounting' are explored, along with the 'Ecosystem Services Approach' for addressing sustainability.

UNSDGs: Sustainable Development and Climate Change.

Most recent climatic factors, such as severe natural disasters, have induced globalized political pressures for climate change impact and sustainable development strategies. Fittingly, Mechler and Bouwer (2015) highlight, throughout their comprehensive evidence, that anthropogenic climate change is modifying weather and climate extremes. The sustainable development goals (UNSDGs) form a universal policy agenda with a target of 'policy coherence for sustainable development', thus interlinking the 17 goals. Tosun & Leininger (2017) explored the governing linkages between the goals and policy integration, suggesting implementation strategies adopted by national governments to implement the SDGs vary at the domestic policy level. Interestingly Tosun & Leininger (2017) mention the variability in domestic strategies to be critical for effective policy arrangements, where policy coherence for sustainable development uses overlaps in targets within the goals to implement localised strategy. In particular, they state policy coherence 'implies that various policies go together because they share a set of ideas or objectives.

> "*Policy coherence can be attained in different ways such as adopting policy measures that help to mutually realize the goals of two or more policy areas, or by assessing the effects the policy goals in one area can have on the attainment of the goals in another area. We are interested in how the SDGs*

related to food, water, and energy security as well as health and societies' capacity to mitigate and adapt to climate change relate to each other".

Tosun & Leininger (2017, p. 2)

From this perspective, the usefulness of Permaculture 'systems design', along with guiding principles may offer a 'ready-made' model for governing the Interlinkages between the SDGs at the domestic level. The exploration of potential viability for interconnecting shared targets within the SDGS by Tosun and Leininger (2017) runs parallel to Mollison's (1988) early theories in Zonal energy efficient planning and food security, whilst mitigating waste outputs of human settlement systems.

The central UN platform for the follow-up and review of the SDGs is the annual High-level Political Forum on Sustainable Development. The 'plan of action' is set to build on the Millennium Development Goals and complete what these didn't achieve. Over the next fifteen years, the 17 SDGs, constructed of 169 targets, will be integrated to balance the three dimensions of sustainable development: The economic, social and environmental.

The thematic issues, including water, oceans, urbanization, energy, climate, transport, science and technology, categorised by the Global Sustainable Development Report (GSDR), partnerships and small island developing states, are supported by the 'Division for Sustainable Development Goals' (DSDG) in the United Nations Department of Economic and Social Affairs (UNDESA), who evaluate UN system wide implementation of the 2030 Agenda, in tandem with advocacy and outreach activities. DSDG aims to help facilitate the translation of strong commitments by stakeholders to implement the global goals.

Facilitating the Implementation and commitment to the goals, the UNSDGs have project profiles listed on the main website, to provide the opportunity for projects to enter partnerships on specific goals. The digital global networking of partnership collaborators, collectively at the local level, has been attributed to thousands of cities addressing their sustainability goals through local cross-sector social partnerships, as support increases towards the universal governmental aims to achieve the Sustainable Development Goals (SDGs) by 2030 Ordonez Ponce (2018). Researcher's and policy makers identified cross-sector partnerships as contributing positively to environmental challenges, with collaborations with

societies being the most valuable drivers and outcomes for organisations (Ordonez Ponce 2018).

Despite a United Nations framework, Rhodes (2015) emphasises how all sustainable solutions are unsustainable over the longer term, if they are not also intrinsically regenerative, which gives hope for the regenerative model of Permaculture to meet the needs of the agenda. However, Bulkeley and Betsill (2013) identify the increasing significance of climate change in urban politics of sustainability, arguing that climate protection is not restricted to local or state actions, moreover, is the implementation coordinated through 'relations between global, national and local actors across state/ non state boundaries'. Supporting the UN goal of sustainable economics, Ordonez (2018) found businesses to have a positive relationship between business' drivers, outcomes and the SDGs, representing an opportunity for businesses to achieve their goals and for business outcomes to contribute to global sustainability. Therefore, it could be suggested that the responsibilities of assisting climate change in urban politics are not, merely, political with geographical obligations, but can be dictated by the ethics and activities of location independent corporations.

Montero (2018) identifies the shift in the modes of operation of the international development apparatus, towards cities, urban policies, and urban planning, intervening in global development problems. The stimulus acknowledged the rising influence of philanthropy in international urban development, through key organizations, particularly the World Bank, and two global think tanks, ITDP and EMBARQ – funded by global philanthropy. International policy adopted several major agreements in 2015 which shape the Motero (2018) documents. This highlighted the key importance of the Bogotá model, from Columbia, which turns organisations to 'solutionism': a persistent focus on solutions and 'best practices' that can be quickly spread as a framework for developmental action. This framework is informed by what funding philanthropists deem appropriate or consider important interventions to global problems. Similarly, at the national level, Akenji (2018) appeals for ambitious and strategic transformative policies.

Integral to the development and adoption of the 2030 Agenda for Sustainable Development were MGoS (Major Groups and other Stakeholders), who, through advocacy and knowledge-share initiatives, have been working in partnership with governments and other sectors,

towards fulfilment of the agenda. The annual review process culminated in the High-Level Political Forum for Sustainable Development. In the farming sector, the WFO and IFOAM – Organics International, form the organising partners of the 'Farmers Major Group' who are mutually accountable for carrying out all responsibilities and duties.

Validation of SDGs within Permaculture projects provides credibility, endorsement and can ease the process of identifying SDGs' partners and funding. Shown in figure 4 below, Mckenzie and Lemos (2018) evidence how Permaculture related projects can attain specific SDGs within the Permaculture context as Permatil projects for Indonesia.

Figure 4: Applicable goals for Mckenzie and Lemos (2018)

International Agriculture Frameworks: The Farmers Major Group.

> *"Farmers are the key to achieve Sustainable Food Security. What farmers produce is the precondition to attain the UN Sustainable Development Goal number 2".*

(WFO 2019, retrieved from: https://www.wfo-oma.org/policy-documents/).

Formed to provide a comprehensive space for all farmers and provincials around the world to coordinate positions, the Farmers Major Group facilitates the complete contribution and engagement in UN processes related to sustainable development. The group aims to prioritize participation of peasants, farmers, pastoralists and fishermen that are from the Global South, and least developed countries (UNSDG, 2019 retrieved from, https://sustainabledevelopment.un.org/majorgroups/farmers). Predominantly they support the efforts of women, children and persons historically exposed to racial, ethnic and gender discrimination. The FMG cohort recognises farmers and peasants make significant economic, social and cultural contributions at all geographical levels.

Erasmus (2019) discusses the agendas of the FMG, expressing, the UN recognises there are more than 570 million family farmers in the world, who provide a critical component to ensuring food security at the global level. This data stimulated agendas at the UN General Assembly where it was announced the upcoming 'Decade of Family Farming was in motion for the period from 2019 to 2028' (Erasmus 2019). Within the group the WFO, serves on the international steering committee (Erasmus 2019) and is involved in the framework which allows countries to develop public policies and investments to support family farming.

World Farmers Organisation

The recognized representative international organisation, WFO, categorises its fundamental purpose to 'foster the economic viability of farming activities, to improve the livelihood conditions of farmers, their families and the rural communities where they work', (WFO 2019, retrieved from https://www.wfo-oma.org/wp-content/uploads/2019/04/WFO_Trade_Position.pdf):

WFO Categories of fundamental purpose:

- Food security
- Value chain

- Trade
- Contract farming
- Women in farming

WFO Recommendation Framework

The policy framework of the WFO summarises the direct course of action required. Expressed as a flow diagram, the statements outline a template to which projects can be designed (WFO 2019 retrieved from https://www.wfo-oma.org/wp- content/uploads/2019/06/WFO-Strategic-Framework_WEB.pdf.)

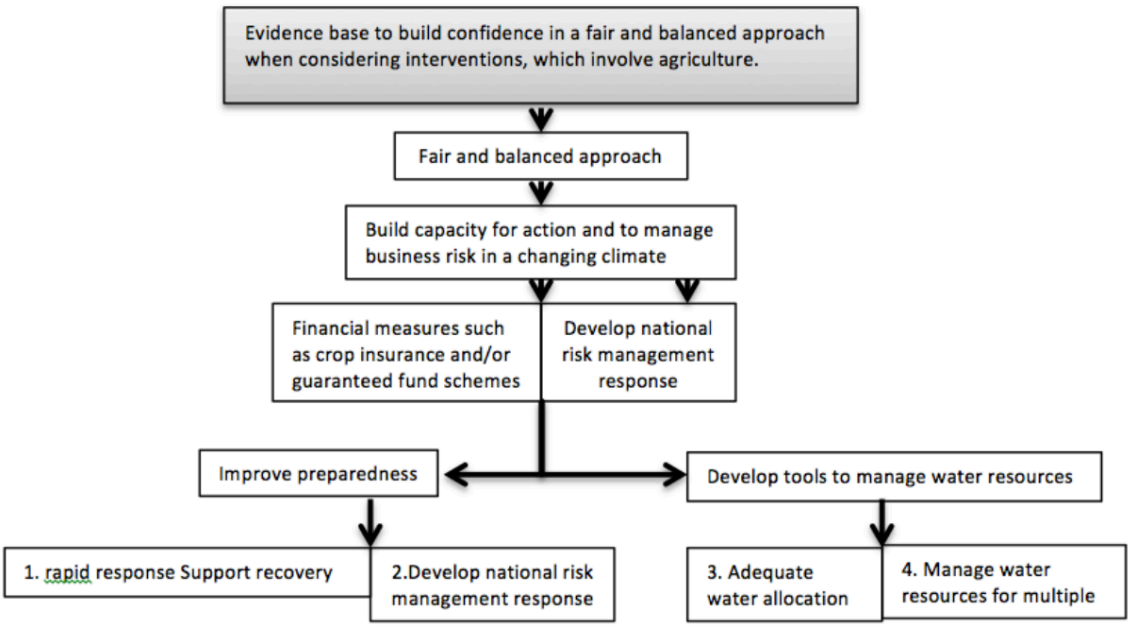

Figure 5: Researchers adaptation of WFO recommendations framework

The WFO state that 'Agriculture must adopt more efficient and sustainable production methods and adapt to climate change', In order to annihilate starvation and alleviate the world's 10 billion people from poverty by 2050 (WFO 2019, retrieved from https://www.wfo-

oma.org/wp-content/uploads/2019/04/policy-climatechange- agriculture_1.pdf). To serve this need, farmers need to be supported through appropriate political and legal frameworks. It is clear that farmers are at the forefront of the challenges and are accountable to meet these global challenges (WFO 2019 retrieved from, https://www.wfo-oma.org/wp-content/uploads/2019/04/policy-climatechange-agriculture_1.pdf). In addition, Brem-Wilson (2015, p.1) identifies that 'direct participation of food producer constituencies is a key component of food sovereignty', supported by the recent policy framework reform of the United Nations Committee on World Food Security (CFS). Brem-Wilson (2015) suggests the reform can be regarded as historically significant to the goal of food sovereignty, acknowledging producers' rights to substantively participate in the CFS.

Proposed Frameworks for Transforming Food Systems Through Full Cost Accounting.

Operating a Full Cost Accounting approach can considerably contribute to remodelling agriculture and food systems.

How does Full Cost Accounting work?

The IFOAM, joint partner of the FMG, stresses the importance of 'Full Cost Accounting' as an approach to evaluate the environmental, social and economic costs and benefits of producing food. The visibility of this data informs the decision-making process, by comparison of human impacts which are translated into financial impact: Currency converts the quantifiable common denominator for the cost of human action (WFO 2019).

Currently, policies in agriculture and food systems do not incentivize the production of 'public goods' such as healthy environment, healthy people etc. Concurrently, they do not prevent destructive practices. It is lesser known publicly, that, in some nations, citizens actually 'subsidize' unsustainable agriculture, through government schemes that promote synthetic fertilizers (IFOAM 2019), resulting in consumers paying four times more for cheap food through their taxes. They pay the full price of the end product, with additional finance and, eventually, mitigation measures for the impacts of destructive farming practices. Furthermore, costs are accumulated on the taxpayer to then purify drinking water and bear

the health costs of illness related to the malfunctioning system. Fighting these hidden costs, the FCA exposes the issues to provide societal benefits of more sustainable systems like organic regenerative farming.

Most significantly, the FCA delivers resilient (economic) arguments for policy alterations that 'incentivize beneficial practices and systems and disincentivize harmful ones' (IFOAM 2019). Although arguments against FCA consider the nature of valuing everything through monetary terms as unethical, it is a universal language understood by businesses, consumers and politicians. Subsequently, financial incentives or disincentives are prevailing ways to influence what actions are taken by all involved. Full Cost Accounting offers an alternative to our current, primarily profit-centric model and is regarded as an important tool for change (IFOAM 2019). The outcomes and effects of any practice, or system, from primary production to final consumption, including waste streams and the recycling of materials, can be calculated based on its costs and benefits.

Table 2: IFOAM Organics International Goals

Goals	**Key Outcomes**
Healthy Ecosystems	• *Improved soil fertility* • *Improved water quality and quantity* • *Biodiversity stewardship* • *Animal health & welfare* • *Climate change mitigation* • *Reduced use of non-renewable resources Waste reduction (non-recyclable materials)*
Healthy Food and Non-food Products for Healthy People	• *The Non-toxic products (i.e. water, food, non-food) Culturally appropriate diets in line with local specificities (e.g. land, climate)*

Sustainable Livelihoods	• *Employment opportunities and decent wages* • *Safe and good working conditions* • *Opportunities for learning and for personal growth*

Addressing agriculture value chains and production-consumption cycles, the SDGs aim for healthy ecosystems, healthy food and non-food products to support healthy people, including sustainable livelihoods (IFOAM 2019). Formulating agriculture-based outcomes from the SDGs allows the MFG to cultivate Full Cost Accounting for food and agriculture systems.

Reliant on scientific modelling for data collection, FCA depicts its conclusions from grouped default values, which are then adjusted with additional data. Accuracy of valuations are expressed to be challenging, due to the requirement of multiple tools, disciplines and methodologies which all accumulate to an inevitable approximation. The result, despite true accuracy, provides consistency in identifying whether key practices impact positively or negatively. The holistic approach works toward improving consistency and accuracy in measuring value, alongside the broader aim of attaining the SDGs.

The common consensus of reversing the global unsustainable course of agriculture needs step by step changes with review, to enhance criteria and refine the methodology continually over time. This would begin with a select set of positive practices which are needed to transform human activity to sustainable and advancing to attain regenerative activity. Interestingly, the comparison between Permaculture Ethics, Earth Care, People Care, Fair Share and the WFO goals shown in table 2 are impeccably similar.

The Framework of Ecosystem Services: A Common Language

It is apparent that the lack of literature on Permaculture's use in policy making is a fundamental flaw in the uptake of the principles, which leads to the question; 'what existing frameworks *are* used effectively in sustainable development planning?'

Understanding the guiding frameworks currently used, such as the SDGs, which are adopted for both national and domestic domains, is a crucial step to potentially bridging the gap between existing formats of road-mapping for common goals within strategy planning and changing global governance practices (Stevens and Kanie 2016). Identifying the frameworks and language used by policy makers, gives insight into the terminology markers within ethnographic data collection, with a view to represent the data in a translatable cross-cultural context. One such framework commonly used is the Ecosystems Services Approach (ESA). This may hold an answer as to how 'Permaculture language' can meet the needs of policy makers. Interestingly, by using Permaculture principles alongside the ESA, as an 'industry language', a cross -cultural discourse could be generated for Permaculture to cross reference data relevant to policy.

In a similar analogy, Tengberg et al. (2012) explore a cultural ecosystem services assessment of heritage values and identity, provided by landscapes. They demonstrate the methods for valuation of cultural heritage and identity in landscapes are integrated into assessments of ecosystem services, to inform policy making and physical and spatial planning for sustainable management of ecosystems and landscapes. This results in an integrated implementation of conventions and instruments that can add time-depth to more spatially focused ecosystem assessments.

Principles of the Ecosystems Approach

Both Permaculture and the Ecosystem Services Approach are governed by overriding principles. Identifying similarities between the two existing systems provides insight into the potential for cohesion between the models for policy guidance. Interestingly, both use twelve principles which guide the decision-making process. There are some apparent overlaps between the principles which are displayed in table 3.

Table 3: Principles of Ecosystems Approach (adapted from the original Convention on Biological Diversity guideline), displayed with applicable principles of Permaculture (Mollison 1988).

Ecosystem Services Principle	ECS Principle description	Applicable Permaculture Principle
Promote societal choice using transparent and equitable processes and tools	Use decision support tools that incorporate viewpoints of stakeholders; recognise conflicting positions and trade-offs and build into processes and decisions in a transparent manner.	Use and value renewable resources and services; Integrate rather than segregate
Delegate decisions to the most suitable scale	Tools to be operable at and across different scales to engage all potential stakeholders; they need to be accessible, robust, flexible and intuitive to enable multiple participants to work at different levels.	Observe and interact Design from patterns to details Integrate rather than segregate
Assess adjacent effects	Tools that address ecosystems as connected and functioning systems, but which can function with evidence gaps. Mechanisms needed to improve framing and bounding of assessments - use natural boundaries at a landscape-scale.	Apply self-regulation and accept feedback; Use edges and value the marginal
Incorporate economic and social drivers	Address and understand the relationships between natural systems, people and the economy. Recognise and assess drivers of change that consider both knowledge gaps and uncertainty. Recognise the complexity of natural systems (not simply stocks) and	Observe and interact Obtain a yield;

	that impacts can be difficult to predict. Tools that can help realise opportunities for new markets and deal with spatial impacts and equity implications are needed.	Use and value renewable resources and services Integrate rather than segregate Use edges and value the marginal Catch and store energy
Encourage ecosystem resilience	identify and value the benefits people obtain from ecosystem services to signpost maintenance, enhancement and, where appropriate, restoration of particular ecological structures, functions and services. The evidence base is a critical consideration. Tools have to be effective at incorporating ecosystem services into contemporary valuation and decision-making.	Observe and interact Obtain a yield; Use and value renewable resources and services; Apply self-regulation and accept feedback; Use and value diversity Catch and store energy

Respond to uncertainty in environmental limits	Current understanding of environmental limits is insufficient. Tools supporting adaptive management, coupled with the precautionary approach, are necessary. Embed social learning within tools to improve future responses and understanding. Realise that many decisions are made in quasi-judicial environments with rights of appeal	Produce no waste Observe and interact Apply self-regulation and accept feedback; Use and value diversity Use small and slow solutions; Design from patterns to details Creatively use and respond to change
Operate at and across multiple spatial and temporal scales	Management interventions and tools need to operate at more than one spatial and temporal scale to meet management objectives -the drivers and responses of ecosystems vary spatially and through time.	Design from patterns to details
Champion a long-term approach	Factor in long-term horizons to enhance the sustainable flow of ecosystem services, the resilience of productive ecosystems, and the satisfaction of human needs in the long term. Ecosystem processes are characterized by varying temporal scales and lag-effects. This inherently conflicts with the short-term focus of economic and political systems.	Integrate rather than segregate Use small and slow solutions; Design from patterns to details

Manage change to best advantage	Tools should help understand and manage change to achieve good/optimal outcomes. Reflect on change and feed lessons learned into continuous policy and management improvement. Exercise caution with making decisions, which lack flexibility.	Observe and interact Creatively use and respond to change. Apply self-regulation and accept feedback;
Champion biological diversity	Embed the non-market value of biological diversity in decision-making tools and processes. Biological diversity is critical both for its intrinsic value and because of the key role it plays in ecosystem integrity, resilience and functioning to provide the services upon which we all ultimately depend.	Observe and interact Use and value diversity
Optimise evidence from multiple sources	Secure evidence from all relevant stakeholders across the different sectors of the built and natural environment (local and expert). Maximise transparent, robust decision-making, ensuring that tools can reconcile conflicting knowledge(s) and views**.**	Observe and interact Integrate rather than segregate Use edges and value the marginal Use and value diversity Catch and store energy

Maximise and maintain stakeholder engagement	Harness and engage the necessary expertise using expert and local knowledge(s) across scales and sectors, bringing differences into formulation of solutions and decisions rather than 'defending' expert views once determined and announced. Use deliberative and iterative engagement tools and target both usual and unusual suspects to capture public views and build a meaningful dialogue.	Observe and interact Catch and store energy Integrate rather than segregate Use and value diversity Creatively use and respond to change

The Ecosystem Services- Futures Toolkit

The ecosystem services toolkit warrants the existing framework's potential applicability to Permaculture modelling. Several distinct tools are used within 'Futures' research and practice. A fundamental distinction can be made between some of Futures' key tools:

The 'Futures Tools and suggested approach to ES proofing' (Carter, Kass, Everard and Scott 2013):

> *(I) Foresight exercises that explore possible future Scenarios along different trajectories (e.g. Defra's Foresight studies);*
>
> *(ii) Visioning desirable futures and then considering possible incremental steps towards achieving those states and outcomes (Backcasting with Roadmapping);*
>
> *(iii) testing plausible Scenarios against set goals (e.g. sustainability criteria) and/or likely and potential stresses or threats (Wind-tunnelling).*

Considering the similarities in Ecosystem Services Approach, it could be useful for Permaculture implementation practices to also adopt tools which assist assessment of impact, with a view for transparency and data collection.

Toward Ecosystem Services Integration with Permaculture

Ecosystem services approach is an interesting topic to be explored, in relation to what frameworks already exist in the decision-making tool set of policy makers. From this perspective, crossovers between Permaculture and ESA can be viewed as having complementary relationships between the tools of assessment for decision makers. The principles of ESA provide an interesting angle for enquiry, when benchmarking and assessing projects using a widely accepted format and can be utilised within the research for discussions with key stakeholders.

A Summary of Identified Areas of Focus, Informed by The Literature Review

The current global climate has given rise to the SDGs which have laid a framework in response to climate change, the social economic crisis, displacement, food security, livelihoods and the collapse of local producers. Climate change is, effectively, coupled with the environmental crisis, directly linked to deforestation, loss of carbon sequestration, the loss of biodiversity and soil erosion. It is clear from the literature review that the issues that the SDGs aim to address are intrinsically linked to, and have an effect upon, human settlements and their relationship to their surrounding environments.

Due to the inter-relationship between human agriculture systems and the wider environment, exploring the domain of permanent agriculture could unearth solutions, in

regard to long term impacts and resolutions to both the climate and socio-economic crises. The literature review communicated a brief chronicle of the history of permanent agriculture, in order to contextualise the current state of agricultural systems, ideologies, and environmental and humanitarian relationships to food production, together, with reference to political relevance. The review highlighted industrial developments which have led to increased machinery, monoculture crop production and chemical fertilisers. This is a direct response to the control and direction of TNCs which adopt a traditional capitalist economic model focussing upon profit and yield. Recently, however, there has been a rising demand for organic produce and an increased awareness and interest in ethical food production.

An emergent grassroots movement in response to both humanitarian and environmental aid is Permaculture. The models of Permaculture are holistic in design and adopt Systems Thinking, to produce integrated approaches which are rooted in values, principles and ethics as a guide, to achieve energy efficiency. The scalable nature of the regenerative practice looks to nature for answers. One such approach, discussed in detail, was that of Forest Gardens. An approach which appears to address multiple problems highlighted in the SDGs. Forest gardens mimic natural patterns of ecosystems. They address the issue of food security by providing edible yield, and commercial products for trade. In response to the climate crises, they sequester carbon from the atmosphere and are effective systems of water management. In addition, they are self-fertilising and require low maintenance for a high yield, promoting high efficiency in terms of energy inputs. Finally, they respond to species loss, by creating diverse organic habitats to increase the biodiversity of any given area. This example iterates how components within permaculture discourses provide solutions to many of the SDGs and their applicable targets, such as zero hunger, good health and wellbeing and climate action.

The literature revealed barriers to Permaculture's adoption as a mainstream contributor. Barriers to permaculture as a solution were discovered to be two-fold.

1. There are conflicting narratives towards the acceptance of permaculture within the scientific community. On one side, it is suggested that permaculture has been ostracized from academics due to its radical holistic nature, conflicting ideologies and refusal to compromise.

2. The alternative perspective infers that prolonged scientific isolation has prevented permaculture from becoming an evidence informed pathway. There is a lack of permaculture literature and peer reviewed studies, accounting for, and immersive of, contemporary developments (Ferguson and Lovell 2014). Effectively, this has resulted in a lack of empirical evidence to substantiate impact claims. Directly pertaining to this issue, recommendations were explored. To address the concern of limited scientific rigour for permaculture claims, permaculture actors would benefit from developing systematic documentation for monitoring local projects and how this can be incorporated into the Permaculture design process (Goldring 2014).

Both claims relate to the notion of permaculture, as a movement, appearing to stand in direct conflict with capitalism and the current economic model. Permaculture is driven by the ethics of people care and earth care as priority, whereas, capitalism is driven by profit as priority. If the philosophies of Permaculture were fully adopted, they would directly conflict with corporate consumerism; for example, Permaculture is pro-localisation which clashes directly with TNCs. This clash of values between the culture of consumerism (driven by TNCs) and permaculture ethics and principles highlight a key disparity, which 'anti-system rhetoric' of Permaculture activists denote as profit vs people.

The UN aims to strategize this global transition into sustainable development through Major Groups' and partnerships. Existing groups such as the WFO formed to tackle the SDGS are seeking to form partnerships with shared actionable goals. This formation of partnerships calls for solutions through collaboration, providing an opportunity for permaculture to integrate into the mainstream. This solution, through collaboration, would need to effectively acknowledge the different value sets, beliefs and ideologies of multi stakeholders. This meets further complexity when in relation to differences of cultures and needs between the global north and south, indigenous communities and localised farming communities. These discourses needs and value sets would need to be identified first, particularly, in order to inform policy making. The review highlighted the need for a model which could bridge cross-

cultural communication, whilst not restricting inclusivity of different backgrounds, cultures, ideologies or beliefs.

Tools such as ESA and FCA along with linguistic techniques for cross cultural discourse mitigation could be valuable in bridging the gap between permaculture and policy, to achieve the shared actionable goals of the SDGS. To effectively respond to the needs of multiple stakeholders, while also addressing interconnected issues in the realms of humanitarian and environmental aid, adaptable and holistic models are urgently needed. Many groups share common goals, the question is how to unite them.

Key Areas for Exploration as Informed by the Literature Review

- Permaculture's role as an assisting tool for policy makers.
- Permaculture's applicability for strategy ES road-mapping.
- Permaculture as a complementary tool, alongside the Ecosystem Services framework.
- Permaculture as a direct response for conservation, specifically through forest gardens and the cultivation of biodiversity hotspots (Poffenberger 2006) and carbon sequestration (Crawford 2010).
- Full Cost Accounting within Permaculture planning.
- Education delivery methods (McKenzie 2019)
- A call to address the lack of systematic documentation for monitoring local projects and how this can be incorporated into the Permaculture design process (Goldring 2014).
- The need to investigate existing models and how to attain this has been suggested using the ecosystem services toolkit, as an example.
- Perceived barriers to integrating social science and conservation. The lack of a common language for interdisciplinary conservation in a cross-cultural context Fox *et al* (2006: 1817-1820)

Literature Review Concluding Statement

The purpose of the literature review was to unearth and explore the practice of 'permanent agriculture', and the Permaculture movement; coupled with the consideration of its relevance and place in the global sustainable development initiatives. In addition, the literature view aimed to examine potential barriers that may inhibit Permaculture's assimilation into the mainstream sustainable development industry.

It is clear from the literature review that there are significant gaps in knowledge/study, such as empirical evidence toward permaculture impact claims, discourse mitigation between cross cultures, and tools for the assimilation of permaculture into mainstream policy and industries.

By bringing attention to these gaps in knowledge and investigating workable models, not solely associated to formal governance, and existing models of organisations responding to sustainable development, there could be potential to effectively bridge organisations and initiatives, so that they may work in collaboration. This could aid in generating wider impact through value based shared action goals and help to achieve the objectives set out in the sustainable development goals of the UN.

CHAPTER 3

Approaching the Research: An Introduction

Methodologically, the project involved conducting an ethnographically led case-study approach, proven as an effective method by Hardman (2012); Crane *et al*. (2012) and Milbourne (2011). Through adopting a multi interdisciplinary approach, this project involved three phases which offered an opportunity to assess the need for, and potential of, Permaculture's role within global sustainable development; specifically highlighting successes and barriers witnessed by stakeholders which has enabled a strong base for recommendations.

Approaching the research required a strategic research methodology to provide and collect data from multiple sources with different techniques. A map of this model was adapted from the strategic approach of Noor (2008) in critiquing case studies, as shown in figure 6.

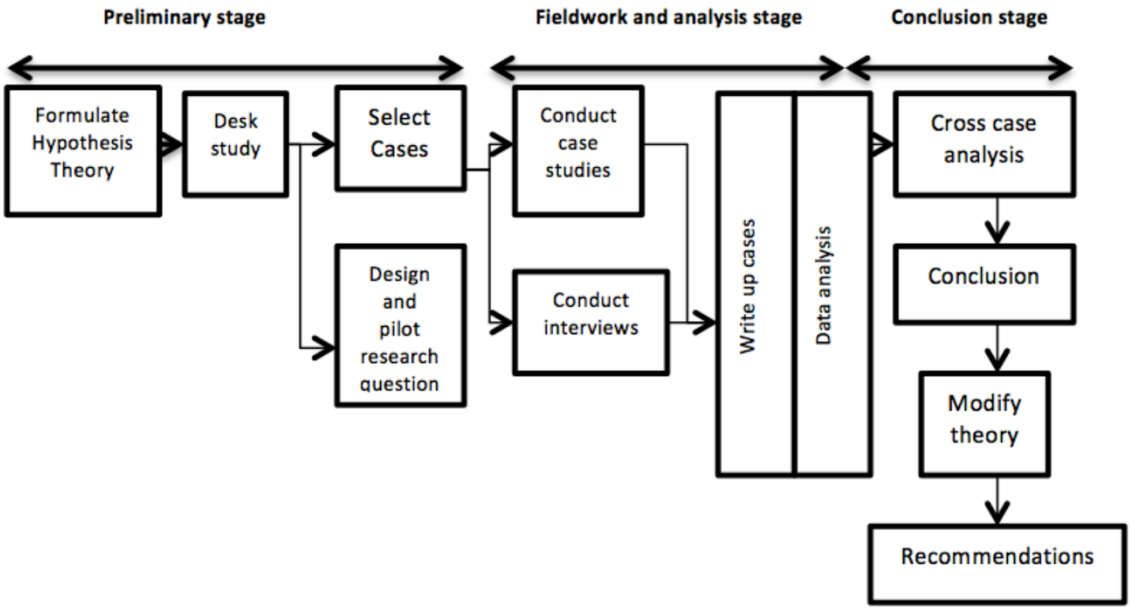

Figure 6: Strategic research methodology, sequence of research and design, researcher's adaptation of Noor (2008, p.1603)

Approaching the Research: Deciding on Appropriate Techniques.

Mentioned in the objectives, the ethnographic approach used was that of Hardman (2012). This was the chosen data collection method, due to its explorative snowballing effect in generating data. Hardman (2012) observed 'Guerrilla Gardeners' in the U.K. This resulted in an interesting account of participants' key drivers, values and inspirations. Guerrilla urban gardening adopts the act of raising crops on various unused spaces and is, generally, regarded as a criminal activity. Hardman (2012) was able to investigate not only the physical impacts of community action, but the social aspects for the actor's actions. Explorative ethnological data collection, interestingly, follows the Permaculture principle to, 'observe and interact' (Mollison, 1988), which allows curiosity into the intrinsic nature of any given system.

Influenced by the anthropological experiences of Weisberger (2013), the project draws on the proficient intricacies of in situ data collection, as documented in '*Rainforest Medicine'*. Weisberger writes of his experiences amongst multiple tribes and documents, in detail, Amazonian indigenous cultures, plants and uses which had, previously, been very vaguely reported upon. Although different to Weisberger's experiences and interests, similarities are found in the in-context approach to documenting the interactions and observations of activists in the Permaculture movement. The project features field notes and interview recordings which depict activist actions. In context, the observation-based, research approach was recently adopted by Crane *et al*. (2012) and Milbourne (2011), which also proved invaluable in the recording of activities of groups, whilst investigating illegal urban gardening (Hardman 2012).

The observation part of this research aimed to study the 'permy-activists' in their creative space: how they functioned as teams, how systems were set up and the general practice of Permaculture. A balance of observations and informal and formal interviews were completed;

as to cover all bases of stakeholder and researcher needs. It is noted, the field researcher interpreting the world, according to their values, can give bias and subjectivity (Hardman 2012; Haviland *et al*., 2010; Jorgensen, 1989);

> *'The modern researcher whose primary task is to convert what is said and observed into a documentary written form, may actually be very partial and selective, albeit unconsciously, in the process of recording'*
>
> Chai (2002, p.3)

Acknowledging the role of researcher, in this context, merits the exploration of the potentially biased role of practitioner, also adopted by the researcher. This researcher already harbours strong tendencies towards the 'ideologies of Permaculture' and is aware that assumptions could be made in alignment with this specific discourse system and cultural outlook.

Awareness of the discussions of Scollon (1996) can aid in the understanding of the researcher's role within a discourse system. Firstly, Scollon likens the role of the 'receptor' in the recording of 'phonetic dictation' to that of a secretary; recording a message to be analysed or interpreted by another person. Secondly, the 'author role' strategizes communication of the word forms, and thirdly, the 'interpreter role' interprets the rhetorical aspects of the communication. Finally, Scollon (1996) states the role of 'Judge' who is responsible for undertaking a response.

In light of this, every effort has been made to consciously adhere to the role of 'researcher' which, inadvertently, adopts all roles within Scollon's (1996) discourse analogy. Firstly, recording the observations and dictations as the 'receptor,' before uptalking the 'Author - interpreter roles' in transcribing the communication of data into text format. Evidently, the researchers' interpretation of recordings formulates the final role of 'Judge,' when critically reviewing observational data. It is of note that the recording of observations was undertaken through a 'receptor' lens, however, according to Chai (2002) there may potentially be unconscious selective recording of data in any, and all, research.

Informal interviews were conducted on site throughout the observation phase. This was a technique used in the observational account of Hardman (2012), whereas the formal

interviews were conducted out of the field, either face to face or via video call. The use of video call for interview purposes, using platforms such as Skype, is now widely accepted as an alternative or supplementary choice for investigators restricted by conventional interviewing. The tool is known to reduce problems related to face-to face interviews (Hooley, Wellens and Marriott 2012, cited by Janghorban, Roudsari, and Taghipour, 2014), however, due to the process 'providing only a head shot' via webcam, there can often be obstructions in observing all of the participants body language (Cater 2011, cited by Janghorban, Roudsari, and Taghipour, 2014). Informal interviewing, whilst observing in the field, provided an open relationship and trust. This allowed for knowledge-share and real time problem solving.

Emergent knowledge was able to be explored in conversation; however, more strategic or systematic questioning could not be covered due to limitations such as privacy infringement from other members in close proximity. This was a challenge also faced by Hardman (2012). The need for formal interviews became apparent, due to the lack of privacy with key stakeholders and project leaders in the field. Semi structured formal interviews were compounded on field observation notes, to provide much greater depth into the actions and motives of project leaders. Drever (1995) suggests the nature of semi-structured interviews allows the person being interviewed to have a fair degree of communicative freedom in what, how and to what extent they express themselves. Ordering the sequence of data collection was paramount to ensure the maximum amount of impartial data was collected. The sequence, therefore, followed a flow from field observations, to informal interviews, and then to formal interviews, as shown in figure 6.

The project thus involves the following three phases:

Phase 1 – Desktop study on the key components of Permaculture and related sustainability movements.

An initial desktop study on Permaculture and the UNSDGs: exploring the various frontier models, in a variety of industries as key case studies in the global context. The latter will enable this phase to connect with phase 2 which will dig deeper into the case studies and their stories.

Phase 2 – Case study analysis of successful models.

A qualitative research approach is adopted to focus on the most successful examples of Permaculture in the global sustainable development field, as identified during phase 1. This enabled the story of each enterprise to be explored in more depth. Interviews and focus groups were used in this phase.

Phase 3 – Key stakeholder consultation, analysis and recommendations.

This final phase will build on the previous two, this time, taking into account the views of sustainability activists. This identified barriers to physical projects and avenues for exploration with partnerships and sustainable modelling recommendations. Recommendations were then provided based on all 3 phases.

The interdisciplinary approach to data analysis follows the consensus of Miles and Huberman, (1994: 9) when explaining the evaluation of ethnographic data. Fundamentally, common themes were condensed from multiple data accounts to form recommendations.

> *"The analysis task [in ethnography] is to reach across multiple data sources (recordings, artefacts, diaries) and to condense them, with somewhat less concern for the conceptual or theoretical meaning of these observations."*
>
> (Miles and Huberman, 1994, p.9: cited by Hardman 2012)

Understanding the Research Subjects: Permaculture activists.

This research is based on detailed interaction with activists of sustainability and Permaculture. Interacting with individuals who challenge the current unsustainable models of existence, takes a degree of open-mindedness. Permaculture concepts and actions can be seen as radical by many (Heckert 2014), however, acknowledging the Permaculture Design system Flower, (Holmgren 2007) which shows the key domains that activists are working hard

to create, provides a baseline understanding of that 'sustainable-regenerative culture'. By understanding these representative domains, appropriate semi-structured interviews can be constructed through conversation, in the most applicable manner for the participant's enterprise. In addition, the 'Clean interview' approach to each conversation was applied, in some cases Lawley et al (2010).

Selecting case studies:

In assessing a varied range of case studies in which Permaculture designs the actions, in relation to reviewed literature of both the global south and global north, the author was able to identify stakeholders. The further identification of which projects would be documented stemmed from discussions with key stakeholders at the Permaculture Research institute, and the literature discussed throughout the literature review, such as McKenzie and Lemos (2018).

The literature identified vital components to the issues surrounding sustainable forest management (Poffenberger 2006), along with the impacts of TNCs in the global south (Weis 2010) and the transition to localised solutions (Warhurst and Dobson 2013; Gray 2007). This stimulated the author's interest, guiding him to explore potential enterprises that employ sustainable agroforestry within a specific Permaculture context. Using online forums, the author discovered the Tropical Permaculture Design Course running in Java, which provided an access route to Permaculture actors and frontiers in the region. This approach to access became the foundation of two case studies. The identification of applicable tools and methods for the mainstreaming of Permaculture became a key driver of the research enquiry (Ferguson and Lovell (2014).

Subsequently, further case studies were identified as relevant, although not were not limited to in situ land-based projects. One example was the pioneering use of technology within the movement, such as computer aided ecological design, pioneered by Daniel Halsey. This included how Permaculture is progressing into the digital design era, in a comparable manner to what is observed in architecture (Kolarevic, 2004: Harris and Harris, 2010). This touches on the emerging ability of designers to address time efficiency and sustainability; an issue raised

by Jedlicka (2010). Due to logistics, this particular case study utilised digital online interviewing to collect data through a discussion with Halsey in 2019.

Whilst in the UK, the researcher utilised existing networks within the Permaculture community, to observe 'professional' Permaculture consultancy from the perspective of designers offering ecological design. Interestingly, the design team were utilising professional design tools developed by Daniel Halsey, which allowed for an interesting ethnographic observation of the points made in interviews with Halsey, in regard to computer aided design.

Researching a Global Movement: The Difficulties and Potential Solutions.

Due to the broad range of geographical locations, not all sites documented could be visited. When this limitation arose, such as interviews with D. Halsey (USA), McKenzie (Australia), Mugarura (Uganda) and the extensive interviews with observed stakeholders from Indonesia, interviews were conducted using online video calls. Examples of their work were identified digitally via forums (Halsey 2019, retrieved from www.Halsey1.com: Jedlicka, 2010; McKenzie and Lemos 2018).

It was acknowledged early on that the sustainable movement has consequences which impact non-sustainable industries. This has been highlighted as a key barrier to success. This factor alone could result in the data collected being somewhat in conflict with current trending non-sustainable profitable markets, such as monoculture agro-TNCs (Weis 2010). Case studies can also be criticised and become victim to the suggestion that there is a lack of scientific rigor and reliability within their content, as they do not accommodate generalization (Noor 2008). Noor (2008) states, from a holistic perspective, multiple case studies can document phenomenon or events, and provide a more rounded picture, due to many sources of evidence. This encouraged the author to observe Permaculture implementation over diverse cases, not restricting to one particular niche.

Gaining Admission: Selecting Permaculture Frontiers.

The research used the snowballing effect, acknowledged by Streeton, Cooke and Campbell (2004), as a means to identify low profile individuals who may not have been published or appear on databases, which present them as belonging to 'hidden or hard-to-reach populations that require identification'.

In order to gain admission, well informed negotiations with gatekeepers were required, to facilitate the ethical obligations appropriate for the stakeholder engagement before and during the research, as advised in Singh and Wassenaar (2016). Singh and Wassenaar contextualise the role of the gatekeeper in social science research, as a fundamental factor in improving the quality of the scientific data collected. In a similar manner to Singh and Wassenaar (2016), strategic planning of the research process was founded around identifying crucial gatekeepers and building a mutually respectful, collaborative network which attended to the needs and vulnerabilities of both the gatekeeper and the researcher.

Gaining admission to the appropriate gatekeeper stimulated research observations in Indonesia. This admission was initiated through the attendance of a 72-hour 'Tropical Permaculture Design Course,' located at Omah Lor Permaculture Centre, Yogyakarta. The network of associates throughout this enterprise laid a base for continued field studies and interviews and allowed the observation of farm techniques and operations and social interactions. Further afield, in Central Java; interviews and observations laid a canvas for a range of Permaculture uses within society. Throughout the time in Indonesia, interviews with individuals associated with Permaculture and communities gave light to their applications in line with their ethos.

Closer to home, interviews with the Permaculture Association UK guided the research to connect with key individuals in the tropical Permaculture domain, who were also involved in the growth of Permaculture in Indonesia. The discussion with research gatekeepers within the Permaculture community; such as, Chris Warburton Brown, Research Coordinator at 'The Permaculture Association Britain', provided critical guidance and signposting to individuals who are pioneering in their fields of research and implementation. Further exposure to actors, within the Permaculture community, were stimulated by the researchers' existing

network, whilst exploring accounts from Steve Jones (UK) and his associated projects in East Africa. Jones also acted as a gatekeeper in relation to connections made with Charles Mugarura of Uganda which allowed for further discussion surrounding Permaculture frontiers in East Africa.

Existing relationships between gatekeepers and the researcher, within the Permaculture community, also allowed for short observations and interviews with practitioners, at the Incredible Farm Todmorden, UK.

Understanding Culture

Anthropologists have attempted to define culture, linking traits of behaviour as a key attributer towards the academic discussion (Baldwin, Faulkner and Hecht 2006, p.4), however it is often limited by context. Ideologies within culture present varied perspectives to discourses (Schollon 1996), the understanding of such enables curiosity when exploring cross cultural collaboration. In the context of this enquiry, a fitting definition is;

> "That complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society".
>
> (Taylor 1871: cited by Baldwin, Faulkner and Hecht 2006, p.9)

Throughout indigenous cultures worldwide, the belief structures formed around animism guide human interaction and relationship with their environments. Due Diligence on the importance of alternative beliefs and cultures is a fundamental aspect of accurate data transcription. This is documented heavily by anthropologists, such as Willerslev (2007) among the Siberian Yukaghirs, Aragon (2000) in central Sulawesi and Harner (1990) who coexisted amongst the tribes of the amazon.

> '*Animism is by many regarded as the earliest form which religion took, and as the root from which derived all religious beliefs which the world*

> *has known and was also the earliest basis of all that is signified by the name of culture*'.
>
> Gilmore (2010, p.6)

Animism is also about the interactions between beings. In a human context, it is concerned with learning to be a 'good person' (Harvey 2005), shown in the religious worldviews of communities and cultures such as the Ojibwe, Maori, Aboriginal Australian and eco- Pagan.

> *'We assume animism stands for a stage of culture in which man may regard any object, real or imaginary, as possessing emotional, volitional and actional potency like that he himself possesses*'.
>
> Gilmore (2010, p. 14)

Easterly, in Timor Leste, McKenzie and Lemos (2018) describe the traditional ceremony of Tara Bundu. Tar Bundu is used to protect land areas and beings existing in the space; it is communally constructed and prevents over hunting and harvesting, in the belief that, if the pact is broken, the culprit would be cursed by nature. This point is made purely for context, with the intention of guiding the understanding that despite geographical location and scientific contexts, globally, some of the case studies herein are subject to completely alternative belief systems surrounding human connection to the natural world.

Mollison (1988) discusses this topic, touching on the interactions of Australian Aboriginal peoples who naturally observed and interacted with nature in a way which was not of division from self, but built upon the understanding that 'humans are nature and fundamentally a piece within its system'. The effectiveness of research is often assessed by outcomes, depending on the cultural viewpoint (Gregory 1983) of what is good or bad. By acknowledging the research is of cross-cultural neutrality, and by applying 'ethno-science ethnography', a method used by Gregory (1983) which aims to apply a valid filter to Ethnocentrism, we can aim toward impartiality in the recording of our observations.

> "Ethnocentrism, the tendency to take for granted one's own cultural view and to evaluate others' behaviour in terms of it, increases the tendency for misunderstanding"

Gregory (1983. p359).

From this standpoint, the task of the researcher merely records from a non-pragmatic viewpoint, unlike the practitioner (Chai 2002), whilst understanding the cultural differences that exist between himself and the participants. Weisberger (2013) demonstrates this when immersing himself with the tribal peoples of the Amazon. He suggests, it is with the prolonged, non-judgmental actions during his stay that built a trust enabling him to record, in detail, rituals within the cultures, which may be soon lost forever.

Designing and Piloting Interviews: Interviewing the Permaculture Leaders

A range of interviewees were selected for discussion of their current practice as stakeholders in projects and their contribution to sustainable development through Permaculture. From early observations, there was a focus upon communication models used within each case study and organization. Operational functionality was highlighted as being imperative to the business activities of the case studies' participants. Modes and methods for team communication were observed to be a crucial component of all training, groundwork and planning which gave rise to enquiry about processes for open communication, due to the team-like structure of collaborative efforts.

Importantly, the value of data gathered through interview techniques depends on the quality of the question and the attention paid to the answers (Rice, 1929). The interviewer's primary tool is the ability to direct attention to relevant information (Walker 2015), to ensure effective information gathering, evaluation, feedback, reflective practice and supervision. Data recorded, however, may then be subject to 'acquiescence bias's by the interviewee (Podsakoff, 2003). Essentially, empirical research shows that 'even a single word can materially lead the witness' (Loftus, 1975; Thibodeau, 2011: quoted by Walker and Lawley 2015, p.1) which can, ultimately, result in compromising the validity of the work (Walker and Lawley 2015, p.1).

Solution

'Clean Interviewing' is an application of Clean Language (Grove, 1989). It reduces *unintended* interviewer bias and protects the integrity of interviewee information (Tosey, 2014: Walker 2015). Clean questions keep interviewees focused on the research topic without restricting or leading the interviewee (Linder-Pelz 2015). The approach asserts that 'these specific questions help us systematically eliminate our own assumptions, so that they do not influence us when conducting an interview' (Nehyba & Svojanovský 2017).

> *"The central and significant feature of the practice is that the practitioner's interventions remain as free as possible from the practitioner's own metaphors and assumptions; hence the notion that the interviewer's language needs to be clean".*
>
> Lawley et al (2010)

As Lawley et al (2010) explains, the core classification of 'Clean Language questions are characterised by their unique form which is designed both to minimise the interviewer's content and to prioritise the client's own experience'. This tool merited further enquiry into how the recording of data could best avoid bias, not only within the interviews but, throughout observations. A further adaptation of clean language, known as Systemic Modelling (Walker 2014), provided a framework of observation into how teams systemize communication. It is adopted as a core method for identifying stakeholders, researcher requirements within the process of research. Furthermore, Walsh et al (2015) identified the 'Clean feedback model' to improve the delivery of teaching through communication, by emphasizing 'evidence first', before recording and delivering feedback. Informative feedback is essential for improving performance and learning, which is influenced by issues such as time constraints, ambiguous communication and emotional barriers (Hattie, 1998). Although In the phase of data collection, feedback is reserved for communication between researcher and interviewees, in a process aiming to improve the efficiency of action, and to direct on-topic attention.

*Clean feedback follows this core sequenc*e (Walsh, Nixon, Walker and Doyle 2015).

1. Evidence (what is seen or heard)
2. Inference (what is assumed)

3. Impact (what impact is evidenced)

The clean feedback model facilitates the learning process. This model dictated how notes were taken, structured and presented throughout the field observations and interviews.

In light of the issues raised by Scollon, surrounding the interlocutor roles of receptor, interpreter and judge (Scollon 1996), the Clean Feedback Model allows for a method which enables the recording and presenting of data to be as accurate as possible.

Data Collection and Analysis: A Reflective Account

Designed to gather a diverse data set of observations and interviews, the study records a broad range of topics. The structure leads the reader into relevant literature, followed by observations and interviews, and returns to the literature to explore 'emergent knowledge' through a lens of comparison. There were some limitations to the approach.

Firstly, there were logistical complexities to gaining site admissions for research and for data collection. Secondly, there was a potential for bias, due to short periodic field observations. It was apparent that community beneficiaries and interviewees, such as students of outreach projects and farmers alike, change weekly on operations. This rendered primary and ongoing interviews to time-limited and difficult to organize. Thirdly, data of one case-study far outweighed the volume of input data, when compared with other case studies, due to the size of the operation and the number of persons involved.

Additionally, the quality of data is not always mathematically represented, as is more philosophical in nature. This is due to specific interviewee's roles, impacts and achievements. These achievements, for example, may include more holistic measurements which cannot be measured quantitatively as their very nature can only be alluded to, or sensed, by the community or individual. In some case studies only one interview was sufficient or possible, due to time restraints and logistical impracticalities.

The following table summarizes the data collected in each case study, where case studies are listed as the entity name and location. Observations are recorded as days or visits, Interview groups are, specifically, individuals within the organization whose discourse represents the

enterprise, and interviews from the community are individuals belonging to the outreach of the enterprises, such as individuals attending a training course, or local farmers visiting the sites.

Table 4: Observations, and interview data collected

Case study	**Observations**	**Interview (group members of the enterprise)**	**Interviews (Community members)**	**Total**
Omah lor Java Java Indonesia	28 days	5 interviews With Founder 3 interviews with Permaculture teachers	10 interviews with course attendees	18
PRI USA representative	0	1 interview Director	0	1
Bumi Langit Java Indonesia	1 day	2 interviews with Founders	3 Interviews with course attendees	5
Incredible farm Todmorden UK	2 Days	3 Interviews with Head Gardener	3 Interviews with volunteers	6
Permatil Indonesia	0	1 Interviews with Founder	0	1
Permaculture Association UK	0	1 interview with Head of research	0	1
Sector 39 UK	0	1 interview Founder	0	1

BEP Permaculture Uganda,	0	1 interview with Founder	0	1
Systemic Modelling, Clean Language facilitation UK	15	15 interviews with Clean Language facilitators	8 interviews with group participants	23
Total	46	33	24	57

During field visits, it was possible to interact with different community members to understand their involvement and reasons for engaging with Permaculture.

Considering the Ethics: Questioning the Permaculture Action

Interacting with Permaculture Activists

The ethics of Permaculture are used to guide education and training yet, for research purposes, more detailed ethical considerations were to be addressed. In some discussions with activists, references were made to the anarchistic nature of Permaculture, leaving the question of whether documenting the movement is ethical. The conflicting nature of Permaculture to the well-constructed International capitalist agro sector (Weis 2012) poses some restrictions, due to the implications of self-sustainability and localisation frameworks.

Early reviewed evidence, of global environmental and social issues, points towards a need for solutions, such as Agenda 21. Despite its, arguably, radical approaches to support agendas to localise, Permaculture appears to be under promoted by the media (Luchkina 2016). Alternatively, it could be questioned whether the research topic is, itself, unethical or are the results produced by the practice unethical? This poses the further question of what the term

'unethical' means and what and who are the parameters and actors who decide upon the definition of 'ethical' in this context?

Generally, the researcher aims to seek truths through observation of the behaviours and decision-making processes within Permaculture frontiers. Essentially, by using the observation and questioning methods (Rubin and Rubin, 2011), the researcher aimed to eliminate bias within research, by providing primary data, along with data generated from the interviewees. Prior to data collection, interviewees were briefed on the project scope and how data was to be analysed. Informed consent, in its basic form, is 'where study participants are given a full explanation and are able to reach a clear understanding of what participation involves' (Wiles *et al.,* 2005; Hardman 2012). Participants were informed of the research, covering: its aims, objectives, methodology and outcomes. Justifiably, the direction of the research altered significantly, converging more on communication tools and identifying internal and external barriers to success.

Similarly, to the work of Hardman (2009; 2012), this investigation did not judge case studies on the end result and observed the 'how's, whys, and evidenced impacts'.

Safety of Clients

There is little understanding of how research into sustainability, and the effects, thereafter, will affect the masses, however, it is widely cited that, 'system change of the *dominant culture of consumerism* is necessary' (Holmgren 2007). This is due to a widely agreed upon belief in the need to prevent ecological collapse though biodiversity loss and global warming. Permaculture, challenges 'politics, economics and social elites, which stand to lose influence and power through the adoption of local autonomy and self-reliance' (Holmgren 2007, p.5). This is expressed in the work of Weis (2012) who highlights the current international food system and its corporate influencers. For these reasons, the safety of information givers, together with the information collated and shared, is of particular importance. The topic can, evidently, spark controversy due to its potential to drastically affect economics at local, regional, national and international levels. A key theme of this enquiry surrounds the move toward localisation. Restructuring, in favour of localisation, can directly lead to the collapse of non-sustainable industries.

Confidentiality and Anonymisation Processes

When negotiating anthropological research ethics, Chenhall, Senior and Belton (2011) found key issues included: *obtaining informed consent for participant observation; the evolving nature of qualitative research; the difficulties in foreseeing changes in approach; and the distinction between the research team and the researched, in participatory action research.*

In response to the difficulties raised by Chenhall, Senior and Belton (2011), ethical approval was agreed upon prior to any and all data collection and was used throughout the research. Participants who interacted through conversation and informal interviews and who requested to stay unidentified are cited as anonymous. The research gathered data from a range of sources, and from different contexts. This was similar to the approaches presented in the reflective account of Hardman (2012). As a result, it was often unrealistic to obtain signatures on the consent forms of participants, instead opting for informal verbal consent.

Where appropriate, participants selected for phase 2 & 3 were provided with a *Participant Invitation Letter and Participant Consent Form which can be found in the appendix.*

The *Research Council UK.* Code of ethics guided the approach to this research.

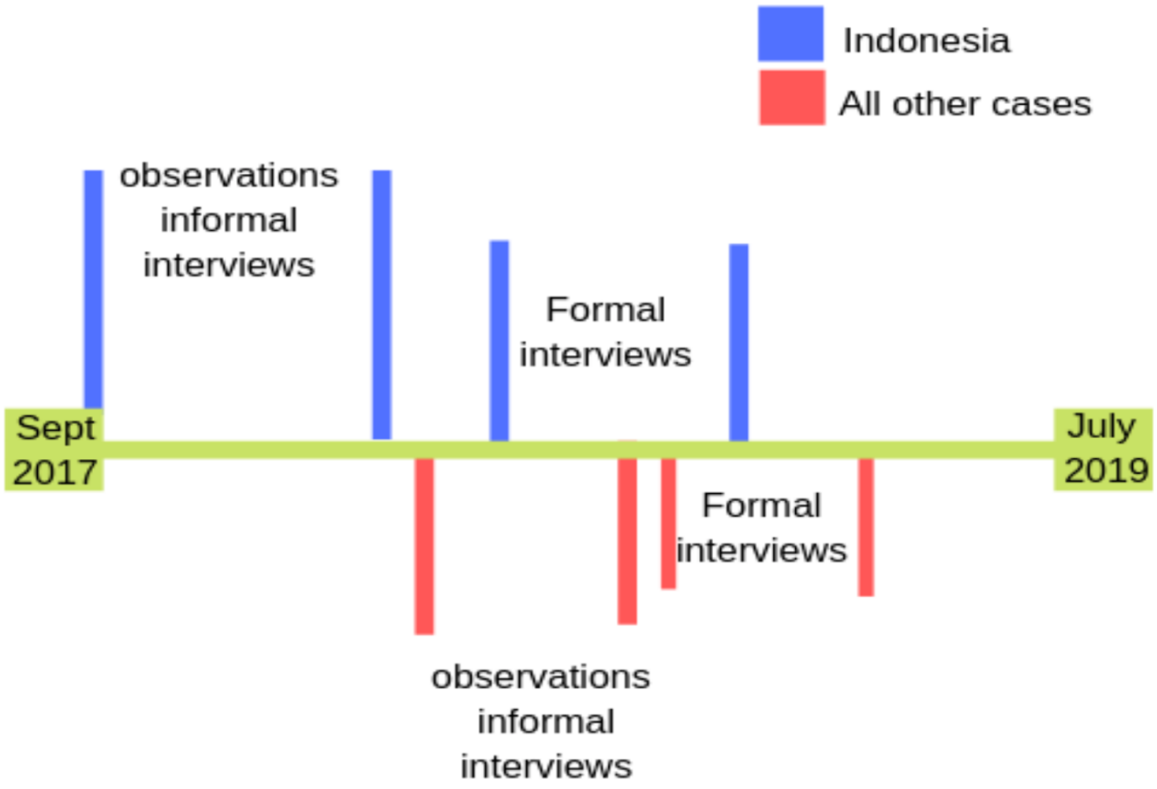

Figure 7: Timeline of research

Interactions with Activists

Essentially, interviews of a semi-structured nature guide the conversation, to help maintain topic focus, in relation to the research (Hesse-Biber and Leavy, 2011: 102). The need to understand discourse groups, and their effect on the varied standpoints of stakeholders within the research, prompted the research of linguistic models which allowed open, non-bias conversations. Wierzbicka (1994) proposes a semantic approach to cultural analysis and cross-cultural communication, arguing, to be able to satisfactorily describe the characteristics of 'cultural rules or cultural scripts' and 'without ethnocentric bias, we need a universal language- independent perspective'.

The notion of a universal language for cross cultural analysis stimulated the exploration of the use of 'Clean Language' (Walker 2012). Clean language is a method of enquiry for project mind mapping and interviewing which assisted in ensuring clarity in recording the evidence. Informal Interviews, effectively, established relaxed communications throughout the field

observations. This proved invaluable. Due to the relaxed nature of conversation, these informal interviews often yielded a greater breadth of data and gleaned greater understanding of the subject matter (Rubin and Rubin 2011, p31).

Field observations relied on several interview techniques with a range of Permaculture stakeholders. This section highlights the complexities of interviewing multinational stakeholders, what questions were explored and how the interviews were conducted. Due to the geographical location of some case studies, language barriers posed some restrictions as to who could participate in discussions. To combat this, in some cases, translators helped with verbal communications.

Cross-cultural, bilingually informed content poses multiple issues, which required that the researcher continually reviewed recordings in a context similar to Small et al (1999), which also included comparisons against the supplementary field observational accounts to validate points made. This was particularly evident on some outreach excursions to farms in Indonesia.

Out of the field, semi structured and more formal interviews (Drever, 1995) were conducted with stakeholders from the UK, Uganda and Indonesia. These interviews guided the discussion, in addition to the data collected during observations. The principles of Permaculture and ecosystem services, discussed at length by Carter, Kass, Everard and Scott (2013), helped to provide insight into how more formal questions could shed light on appropriate topics, along with questions suited around 'best practice'. These principles are found in table 5.

Using the Ecosystem Services' principles, with accompanying descriptions, was a useful compass to uncover data which was relevant to the topic of sustainable development and how participants are evidently, consciously or unconsciously, applying these principles. Interestingly, by using these principles as a 'guide for conversation', it was highlighted that there could be potential to formulate data in a cross-cultural discourse which would appeal to policy makers. This method could, potentially, bypass inherent inference in the recording of data, due to the existing framework's governing ideologies. This was an attempt at bridging the gap between two very different discourse groups, by identifying what frameworks and language policy makers are currently operating with and then, applying the terminology to

the ethnographical data collection, to represent the data in a translatable cross-cultural context.

The range of participants was selected through a process of research using the snowballing effect and referrals, developed through the gatekeeper', to shed light on their processes and connection with the Permaculture methodology of interconnected systems.

Principles of the Ecosystems Approach

The ecosystem services principles show in table 3, (adapted from the original Convention on Biological Diversity guidelines) gave some direction as to appropriate topics of discussion. In particular, the descriptions of the principles of Ecosystem services, along with the principles of Permaculture, gave guidance as to 'what to look for', in terms of applicability to sustainable development and evidence impacts, relative to the assessment of policy makers. The description gave topical conversation guidance, in and out of the field, for discussions with participants. in particular, this provided effective guidance for 'Group Members' who had a firm association with the enterprises and often had decision making influence over the direction of the project.

Engaging with Global Key Actors.

In the process of interviewing, the information gathered did not necessarily merit full documentation, yet served to guide the author to suitable candidates for the study. One such case was an interview with the Head of Research at the Permaculture Association UK, Chris Warburton-Brown, who provided the necessary guidance and direction for the following interviews. An extensive list of interviewees is provided in table 6, who were interviewed using a formal, semi structured method.

Table 5: List of interviewees, from formal semi-structed interviews

Interviewees	Role Location

Chris Warburton-Brown	Research Coordinator Permaculture Association Britain
Steve Jones	(Sector 39 UK, Permaculture Association Teacher)
Charles Mugarura	Former Head of Education, Training and Research at Permaculture Research Institute of Uganda)
Dwi Pertiwi	Omah Lor Java, Indonesia
Michael Smith	Incredible Farm
Lachlan McKenzie	Permatil Indonesia
Caitlin Walker :	Director of Clean Learning Systemic Modelling (TEDex UK)
Daniel Hasley	United Designers, Natural Capital Plant Database, Permaculture Research Institute, Australia 2012 -Present **Associations:** Board of Directors – Gardening Matters (Non-Profit) President 2013 Permaculture Research Institute, USA
Autonomous participants	Omah Lor PDC participants, farmers, local project stakeholders

Reflecting on the Data.

The cases presented were analysed 'using conventional qualitative techniques of thematic coding and sorting' (Milbourne and Doheny, in press: 4, cited by Hardman 2012). This form of analysis, ultimately, ascertains 'common themes' scribed throughout the collated interview transcripts and field observational notes (Hardman 2012). The focus of this thesis, however, explores the various successful frontier models of Permaculture in a variety of global contexts, whilst recording the motives of sustainability activists.

Despite the range of potential techniques for analysing data, this study used a less formal approach to interpret the data and found reasoning in the common themes. On analysis of the data set, the researcher reflected on the experiences of ethnographic immersion. The analysis followed numerous stages in order to decode the common themes, and similarities, which constructively accumulated to build theory (Fontana and Prokos, 2007; Jorgensen, 1989 cited by Hardman 2012).

Due to the range of methods used for recording data, the ongoing 'formal interviews were" influenced by the observation codes and data' (Hardman 2012), specifically in relation to Permaculture enterprise. The cumulative nature of data collection from observations and interviews, shown in the timeline of events in figure 7, allowed reflections of observations to establish themes which guided all further enquiries.

> *"The analysis task [in ethnography] is to reach across multiple data sources (recordings, artefacts, diaries) and to condense them, with somewhat less concern for the conceptual or theoretical meaning of these observations."*
>
> (Miles and Huberman, 1994, p 9
> cited by Hardman 2012)

As stated by Miles and Huberman (1994, p.9), and used as a framework for Hardman's (2012) study of the illegal activities associated with groups conducting 'Informal guerrilla gardening', the recordings condensed core intrinsic messages from stakeholders across the various contexts to generate generalisations. This eradicated un-needed portions of data from observations being carried forward into interviews, in which, limited time exposure to

activists required precision questioning on issues which concerned common themes, such as; ‘restrictions to the mainstreaming of Permaculture, the relevant partnerships and the use of a common language’. Eradicating the irrelevant data in this way, and distilling it down to its necessary form, is an example of data reduction (Hardman 2012), through the consolidation of only relevant data prescribed by the emergent common themes. The result of this consolidation led to a specific focus upon topics such as ‘the lack of common vocabulary’ *(*Fox et al 2006), education, and the Forest Garden approach to land management (Crawford 2010).

CHAPTER 4

Jungle in the city

Introduction

The following case studies were conducted to understand Permaculture applications in the field, potential benefits to assimilation and thoughts of permaculture actors in regard to its mainstreaming, pros, cons, needs and barriers.

This chapter is initiated with the explorative account from the researcher's ethnographic journey and extended time with Permaculture activists in Indonesia. By viewing the methods of integrating Permaculture in the physical and social domain of a jungle environment, on the edge of a dense urban setting, this experience gave witness to a range of 'sustainable developments' and associated social impacts. Omah Lor, Permaculture centre in Yogyakarta, Indonesia, runs regular Permaculture education. The site boasts impressive bamboo architecture, on the bank of a river, with large communal areas for cooking course functions.

Figure 8: Omah Lor Permaculture center Yogyakarta, Indonesia

Source; researchers photograph.

Forest garden guilds are used throughout the site, which is nestled amongst subtropical jungle close to the city. in a similar vein to Crawford's (2010) temperate forest gardens, crops with commercial value are targeted; often bumper insurance crops for economic resilience. The species chosen are, Citrus hystrix, Cinnamomum verum, Albizia chinensis, Dendrocalamus Asper, Gigantochloa apis, Cymbopogon nardus, Cymbopogon citratus and vetiver. Soil creation is intensive and proactive, with the use of additives such as activated biochar and compost which are generated on site through multiple methods. Display gardens are used throughout, showcasing a range of techniques, such as banana circle composting. This is a technique used for composting organic matter in a pit, surrounded with a planted mound, using papaya as a canopy species, and bananas and vetiver grass for mound stabilisation. Fundamentally, the regenerative approach of forest gardening is a direct response to the alternative detrimental corporate practices associated with deforestation, such as large-scale monoculture farming, documented throughout South East Asia;

> ‘The rise of state agencies and private companies as forest managers have generally coincided with an accelerating loss of natural forests throughout the Asia region during the post-World War II era’.
>
> *(Poffenberger 2006, p.58)*

> ‘In Southeast Asia, tropical rainforests receded from 250 million hectares in 1900 to below 60 million in 1989’.
>
> *(Poffenberger 2006, p.57).*

The site, nestled amongst diverse inter-planted forest, is an example of a privately-owned multifunctional Permaculture demonstration arena, open for both eco-tourism and education. Nugroho, Pramukanto, Negara, Purnomowati and Wulandari (2016) promote the use of rural ecotourism as an important factor in preserving cultural heritage, conservation and in generating a stimulus within the rural economy, which alternatively could succumb to non-sustainable industry. In this case, the multifaceted approach of localised cultural support, by involving local people and enticing international ecotourism, for educational experiences, builds an effective system (Nugroho, Pramukanto, Negara, Purnomowati and Wulandari, 2016).

In an interview with McKenzie, he advocates the use of demonstration sites as a fundamental component in the success of Permaculture uptake in Timor Leste. Similarly, Omah Lor follows this model, allowing visitors to receive a multi-sensory experience to build a ‘belief’ in Systems- Thinking through direct experiences. The participants attending courses are diverse; some are sent by an Islamic boarding school, some from seminary (catholic), some are Tibetan Buddhists, Hindus, teachers, university professors, farmers and others are NGO workers.

The people staying at the site are from a range of backgrounds. There is an encouraging sharing of knowledge at the facility with teachers from local Permaculture farms and neighbouring countries like Malaysia, and Australia.

Box 1: Extract from authors field notes

Spiritual Relevance

Although this study refrains from focussing upon the spiritual component of the governance of land use, it cannot be overlooked. In conversations with different members of the community, the topic and notion of different belief systems existing throughout Indonesia were given, which are still fundamental aspects to some of the tribal cultures as seen throughout belief structures of animism, Hinduism, and Islam.

Some community members gave experiential accounts of rituals performed in older cultures to bless the land. One member had witnessed these in Sumatra. Conversations suggested some priests in the surrounding areas had healing powers and are sometimes needed to help people and the land. There is a religious or spiritual aspect to respecting the land and water, and water rituals are a part of one visitor's practices. On one full moon, chants of mantras can be heard in the river valley. After meeting with a priest, he offered a flower essence to a few community members as a blessing. He had collected the flowers at first light and the water from the sacred spring waters. I was told people travel from all over the world to receive those blessings and healings. There is a deep respect for the natural cycles, and a ritualistic culture to honour what nature provides, at least in one community visit.

Box 2: Extract from authors field notes

The account above was derived from a trip to a remote neighbouring village, in 2017. As a researcher, the philosophical approach to accounting for the practitioners' or communities' motives are often regulated by documenting what was observed, to formulate theory (Chai 2002:3). The cultural significance of spiritual practice, in connecting people with the environment, has been a key interest of anthropologists and ethnographers documenting behaviours, such as Weisberger (2013). Weisberger spent ten years observing indigenous tribes of the upper Amazon. In his commentary, he suggests that his recordings of the rituals, lifestyles and plant knowledge, shared to him by those he documented, offer cultural and environmental education to support the protection and reverence of the rainforest. He prescribes the connection between land and people directly;

'It can be said that the link between the natural environment and people is the basis of culture.'

Weisberger (2012, p.3)

Constructions

The development itself is constructed using a range of sustainable materials such as bamboo, with very minimal concrete foundations. The proficiencies required to complete such expressive quality of bamboo architecture, enlisted a team of evidenced masters of the craft.

Box 3: Extract from authors field notes

Saxena and Tomar (2019, p.1) identify bamboo as having a 'strength to weight ratio and aesthetics valuation higher than alloy steels, hence it is useful in ultra-luxurious segments of society'. Partnered with benefits such as a 'rapidly-renewable, low-carbon, and sustainable resource,' Schuman, Hauptman and MacDonald (2019, p.1), identify that 'bamboo rests underutilized, globally, due to laborious manual evaluation and fabrication techniques and deeply-rooted aesthetic stigmas in western culture'. The laborious execution of bamboo construction commences with freshly cut bamboo placed vertically on a box with borax solution for 14 days, followed by solar drying for one to two months. Alternatively, the traditional method submerges the bamboo in muddy water for six months, before drying for three months. Schuman, Hauptman and MacDonald (2019) suggest, the widespread implementation of bamboo is limited by its cultural perception, however, in cases, such as Omah Lor, the edges and margins of what is questioned possible is stretched, in their quest towards sustainable development. Bamboo also offers a uniqueness to their design.

Distinctive, alternative architectural aesthetics provide a breath of freshness to eco-tourism offerings, presenting unique experiences for visitors of Indonesia. Sourcing the quantity of structurally adept bamboo for a project this size required external sourcing to limit project time drift and to guarantee completion.

Box 4: Extract from authors field notes 2017

Although the site is still under construction, our sleeping arrangements accommodate 6 participants on the middle floor of the central bamboo tower. The nights are cool in temperature, with awe-inspiring nights skies shown through the open sided building. Through the day the gentle breeze keeps the room temperature comfortable. Conversations often dive into the projects the visitors are working on and how Permaculture is going to benefit them when they return home.

Box 5: Extract from authors field notes 2017

McKenzie (2018) identifies the use of bamboo plantations as being the most efficient way to produce high quality bamboo. This offers the potential to automate the production on site. Bamboo is not only beneficial as a building resource but provides; 'shoots for eating, leaves for animal food, and bamboo charcoal or wood for cooking and soil improvement'. Alternatively, it is planted to fulfil the needs of a windbreak, or a fence. Using bambusa vulgaris is effective for erosion control, in systems such as swales, rivers and springs, water channels, ponds, and roads Mckenzie and Lemos (2018). Around the course of the river, bamboo is found to be abundant, yet is left in-situ to prevent further bank erosion. It is important to note, bamboo used in structural development is harvested after reaching 3-year maturity (McKenzie and Lemos 2018).

Since opening to the public, bamboo-building workshops have often been held at the centre, in a mission to re-educate on the use of such a useful and robust sustainable material.

Figure 9: Bamboo construction workshop facilitated by Yayasan Bringin Foundation Yogyakarta Indonesia

Figure 10: Drone image of Omah Lor from above (source owner of Omah Lor).

Figure 10 shows a drone shot of Omah Lor from above, showing the use of bamboo tiling on buildings draped over the edge of the steep riverbank. Utilising the steep banking for construction maximises the use of land; in this case, by building tall and on what would be very difficult land to cultivate. The design is elegant and hangs over the steep riverbank, with large vertical open fronted towers shaped like an upright sinking ship. The outer tiles are crafted from spliced bamboo, cut to fit. Ventilation occurs, naturally, through the large river valley. The boat-like shape of the structure encourages air flow and rain run-off, directing water to the pond at the bottom of the bank.

Despite the visually impressive result, concerns were voiced by local people early in the construction phase. In an interview with the owner, she recanted their concerns;

'*The locals say our buildings would not withstand the destructive tropical weather patterns or frequent earthquakes.*'

Interview with the owner (2018)

Over a year after leaving the site, a follow up interview with the owner was conducted, to find out how the constructions had performed throughout the seasons;

'An earthquake had destroyed many traditional homes in the area. The only damage received to our bamboo buildings was from a neighbour's mahogany tree falling on the roof of one of the bamboo towers, but it only split a supporting upright which we repaired easily.

Interview with the owner (2018)

Usually, in preparation for adverse weather, all the big trees are pruned before the rainy season to avoid damage. The owner humoured the ease of the rectification, stating:

'They said my home is not safe, now they see why I think our home is safe. With all the plants around and all the design, it is pretty sound; all the concrete houses were flattened by trees, only our tower stood still "

Omah Lor owner 2019.

This case has shown effective planning and effective land management, in preparation for crises. This has provided insight into how natural resources can improve resilience, and point toward a strategy for crisis damage limitation, while also generating a yield from a form of timber which serves many functions.

Box 6:Extract from authors field notes

Box 7: Evidence of the incident displaying the bamboo towers structural integrity after a storm, Source, Yayasan Bringin Foundation (Omah Lor owner)

Traditional Javanese Structures

At the epicentre of the site, the kitchen honours the traditional architecture of Javanese wooden houses (Joglo), which use frame structures of timber as the principal material. Prihatmaji, Kitamori and Komatsu (2010) explain 'Javanese wooden house designs commonly use tongue and gull's connection systems (mortise and tenon), which function as a lock inserted into the hole of the mortise column. The structure used as the central kitchen, at Omah Lor, uses the principles of Javanese structural and architectural elements, which are divided into three parts; recognized by Prihatmaji, Kitamori and Komatsu (2010, p.1) as:

1. *Under-structure or foot: the foundation.*
2. *Intermediate structure or body: the main column.*
3. *Superstructure or head: roof frame.*

The justification for using these materials and assembly techniques is the 'Cooperation of opposite behaviour between foundation joint and the core structure joint,' resulting in 'earthquake resistance impact' identified by Prihatmaji, Kitamori and Komatsu (2010, p.6). This is a direct response of the 'foundation joint and core structure joints having contrasting behaviours, respectively, reinforcing each other. Another vital component is the flexibility of the foundation joints between all columns and stone, as opposed to the 'core structure joint between columns and beams being rigid (Prihatmaji, Kitamori and Komatsu 2010, p.4).

Figure 11: Kitchen area Joglo design construction (source authors)

Using this structure as a central build design in Java can pose some risk. The structural rigour of the Joglo design has often been scrutinised (Idham Numan and Mohd, 2010; Prihatmaji, Kitamori and Komatsu 2015: Prihatmaji, Kitamori and Komatsu 2010), however, the exploration of fundamental building failures, as a result of the 2006 earthquake , Prihatmaji, Kitamori and Komatsu (2010, p.2) conclude that general structural failure was not from

structural performance and that structural failure was due to 'wood decay by fungi, termite attack and lack of maintenance.' The evidence for this is found in the wooded joints, which were still intact, following the earthquake. Therefore, the general management and maintenance of structures of this kind are paramount, to ensure their longevity. Noticeably, the open sided construction shown in Figure 11 allows ample airflow and the protruding roof prevents water saturation of timbers.

Economic growth with Organic Food Social Enterprise

Outreach and Historical Governance

Although Permaculture is not exclusive to agro-ecology (Holmgren 2007) or forest gardens (Crawford 2010), in the case of the South East Asia biome, land management is often implemented with agro-forestry methods and principles (Poffenberger 2006).

Over the past three decades, throughout SouthEast Asia, blooms of support have emerged, guiding communities to re-establish management of their forests (Poffenberger 2006). This has resulted in planners and policy makers developing national Community Forest Management (CFM) policies, supported by reformed legislation, which empowers local governments, and their residing communities, with stewardship rights (Murray and Tania 2007). The reform has attracted hundreds of millions to be invested by development agencies, intentionally creating the urgency within governments to give CFM implementation high priority (Poffenberger 2006). In many cases, NGOs have focused on building CFM support around community organisation and livelihood enhancement (Poffenberger 2006), which, from observation is of utmost importance to the associated non-profit enterprise Yayasan Bringin Foundation, located at Omah Lor

Many of the visitors attending the course are landowners and stewards looking to learn how to develop the land they manage with permaculture knowledge. Some are focusing on crops

for enterprise whilst others are seeking help at going back to organic farming principles for self-sustainability

Box 8: Extract from Authors field notes

Historically, 'Southeast Asia's forests were nationalised in the 20th century, displacing indigenous systems of forest management and resulting in the expansion of regulated and unregulated timber industries to expand operations throughout the region' (Poffenberger 2006, p.58). Although the practices of these industries are seen as catastrophic from outsiders Laurance (2007), other opportunities have arisen to regenerate spaces with selective ecological and business planning (De Oliveira et al 2013). This is shown in the outreach programs of Yayasan Bringin Foundation.

These opportunities are often sought for by Permaculture activists, who understand the missing link in top-down resource management. In a study for the World Bank, Bromley and Cernea (1989) reported that;

> *"The dissolution of traditional local institutional arrangements has not been followed by the establishment of more effective institutions, and national governments in most developing countries have not adequately substituted for these former resource management regimes."*
>
> (Bromley and Cernea, 1989; cited by Poffenberger 2006, p.58).

The concept of capitalism, in reference to ecological impacts, is often associated with detrimental activities and for good reason. This can be seen in the timber trade and is documented by Poffenberger (2006), however, throughout the observations, the researcher could not help but wonder;

Is the birth of ethical enterprise the answer to global ecological regeneration? If the dissolution of the centralised government's ecological awareness and enforcement is so evidently flawed in these areas, does that leave ethical action to the responsibility of

enterprises, non-profits, charities, CICs or other organisations? If so, what ethical methodological approach are enterprises and these organisations using, when processing ethically based decision making?

Box 9: Extract from Authors field notes

Warnings in the 1980s raised the issue of the deteriorating status of upland watersheds and lowlands. The warnings gained public attention, due to floods and brownouts affecting major cities such as Jakarta and initiated a new wave of environmental protection policies associated with deforestation, such as logging bans. Associated with this movement, recognition surfaced of the important roles rural communities had in managing and protecting forestlands.

The systematic approach of Permaculture in the cultivation of forest garden development, consciously considers the impacts of interventions, good or bad, for all surrounding communities, along with the economic benefits toward the entire community. With this in mind, It would appear Full Cost Accounting is just a logical, natural, informal process of the teams' design process.

Box 10: Extract from Authors field notes

Figure 12: Yayasan Bringin Foundation outreach forest garden planting, Java

Image source: Authors

> *"Each year more nations are approving initiatives that provide forest user groups with greater rights and responsibilities in the care of protected areas, upland watershed forests, production forests and timber concessions."*
>
> (Poffenberger 1996: cited by Poffenberger 2006, p.59)

Anthropogenic interest in forested areas is inevitable, with around one third of the population of South East Asia being forest dependent people (Poffenberger 2006). The severity of ecological disturbance is dictated by how activities are carried out. Often referred to as 'slash

and burn', long rotation forms of agriculture, also known as swidden or 'jhum' farming, are generally collated into one broad category. They are identified as some of the earliest forms of agriculture. Typically used in upland environments, swidden systems are often chosen for sites where soil fertility limits the amount of crop cycles to several years. In these systems, it is widely known that yields are dramatically reduced after the initial burst of productivity.

The connection between effective forest management systems for stakeholders and Permaculture lies within the design process of which, the ethics governing the principles provide a framework to make effective decisions, they are not merely based on economics but upon the care of earth and people.

Box 11:Extract from authors field notes

The employment of indigenous techniques, combined with scientific knowledge, are often used throughout the district to restore forests into sustainable gardens. In support of this theory, Poffenberger (2006) identifies, 'many traditional shifting cultivation systems in Southeast Asia are developed, to minimise erosion and fertility loss, ensuring healthy and rapid forest succession and allowing for future agricultural use.' Indigenous forest farmers usually plant a variety of species within a swidden field, diversifying to mitigate risk and provide a mix of subsistence food and cash crops too.

The interesting component of Permaculture's role in forest management, in the Java region, is the redevelopment of, what would be classified as, wastelands or under productive rice fields into forest gardens. The intrinsic knowledge and wisdom, to assist the land into succession and reap returns, is beginning to solidify as the obvious answer, as it appears economically fruitful, ethical and environmentally impactful in its practice

Box 12:Extract from authors field notes

Figure 13: Early stages of forest garden planting Java Indonesia, Source author

Productivity of optimum yields, when managing forest gardens, is found in orchard systems and by allowing a forest to reach its natural maturity (Crawford, 2010). The management tool of 'rotational swidden farming,' in the tropical domain, has thus evolved into more permanent agroforestry systems, which allow canopy climaxing, yet manage species distribution. The initial components taught throughout tropical PDCs, and thus forest garden cultivation, identify with multilayered system planting known as polycultures (Leibman, 2018). This is often initiated with ground cover food crops (tubers, corn, rainfed rice) whilst inter-planting with perennial cash crops (Poffenberger, 2006). These are actively encouraged to dominate for their long-term yields of subsistence-oriented foods, spices and other goods.

The core implications of this sedentary agro-silvicultural system include; improving hydrological function and biodiversity habitat, stabilising forest cover and reducing land disturbance and soil erosion (Poffenberger 2006; Crawford 2010).

Limitations to the transitioning to this agro-ecological model still remain, despite the ecological benefits, with land tenure insecurity posing a barrier to external assistance. Movement towards more commercially coerced monoculture agricultural systems, amongst the upland forested watershed, is suggested to be directly related to the 'unclear tenure status of upland communities.' This attracts lowland migrants and their farming methods. This results in the application of conflicting mismatched farming techniques. In these areas with steep slopes, this has proved to rapidly deplete soils and be a catalyst of erosion.

Despite the focus upon forest and agricultural land dwellers, urban dwellers are not isolated from the ill effects of land misuse, such as deforestation. The severity and frequency of downstream flooding and power shortages has developed an environmental understanding among the urban middle classes. This has been gained through the communication stratagem of the mass media, to put pressure on the government to take action. Due to the growing concern from both rural and urban dwellers, throughout Indonesia and South-east Asia, national discourse has adopted a 'civil society dialogue.' This has been an attempt to consolidate the energies of stakeholders with working groups. The responsive actions of the national government have been to reimagine and change the roles of local governing bodies and communities, through 'democratisation and decentralisation policies.

The location of Omah Lor, situated close to the city, yet still forested and on a riverbank, allows urban dwellers and rural communities to observe the potential possibilities that exist within urban boundary settlements, and the environmental safety buffer that these models, arguably, pioneer.

Box 13: Extract from field notes

These steps, in the direction of regeneration, devolve policies to decentralise government administrative functions to the district and sub-district level officials who are downwardly

accountable to local populations (Poffenberger, 2006). This has allowed cases, such as Omah Lor and the *Yayasan Bringin Foundation*, to participate in resource stewardship, albeit through a mix of privately owned and non-profit outreach. In outreach programs where land tenure is unclear, the encouragement of land stewards candidates to participate in resource stewardship, and formally institutionalise it within a governance framework, is suggested (Ribot, 2002;Poffenberger, 2006), however, the inclusion of effective resource use is covered extensively in Permaculture education, specifically by Holmgren (2007).

On the Ground Community Forestry Impact.

Gathering intensified attention over the past 30 years, public forestland management, known as 'Community Forest Management,' has crept into supportive policy. This helps to expand investments from agencies (Poffenberger 2006). This encouraging model, when compared with the 'Permaculture flower' of Holmgren (2007), could be assumed to fall under the 'social Permaculture' category. This appears to formalise, through policy, what Permaculture attempts to do from a non-governance perspective. Ferguson and Lovell (2014), specifically, review Permaculture for agroecology, as both disciplines have grown in parallel. Both harbour overlapping concerns, while developing different constituencies share focus on the intersection of ecology and agricultural productions, however, it is highlighted that Permaculture has fallen short of exposure in agro ecological literature. Permaculture draws from a toolbox of resources and systems (Mckenzie and Lemos 2019), which could, potentially, fulfil a role in the assistance of rolling out CFM policy strategies developed throughout South East Asia. These strategies too aim to support community involvement in the management of forest. On the ground, from a researcher's perspective, it is exciting to observe the growing instances of community networking and mobilisation through 'Permaculture.' In addition, it is interesting to note that the concerns regarding ecological resilience and livelihoods are shared.

Looking back at the early work of Mollison (1988), the message for the world referenced the ancient methods of sustainable management, which identified indigenous practices and connection to Gaia as a crucial missing component from the industrialisation of ecosystems. Interestingly, in a similar context, Poffenberger (2006) identifies the shift in policy makers opinions by stating;

> "*An increasing number of government foresters, who once bitterly criticised forest-dependent people as the root cause of deforestation, now view them as the best method to restore and protect watersheds and forestlands."*
>
> (Poffenberger 2006, p.64)

The impacts of Omah Lor ripple out from the core site and have led to a new initiative to establish resilience through the creation of a Permaculture village; "Involving the mothers only for the beginning, starting with 40 mothers opening a village market where villagers trade crops and crafts" (Interview Omah Lor Owner). This example expresses a non- formal, collaborative multi-stakeholder partnership between farmers and foresters, enabling farmers to make significant contributions to the sustainable development of semi-rural land. Essentially, the initiative encapsulates the need for tailor made programs to address gender inequality and support women farmers. Internationally, women perform a fundamental role in the agronomic sector, covering all aspects of production, combined with responsibilities of food security and childcare.

The World Farmers Organisation (WFO) advocates to empower women farmers, in order to realise global food security. Which is gender displaced as 80% of food production in African countries, 60% in Asia and between 30 and 40% in South America (WFO 2019, source https://www.wfo-oma.org/wpcontent/uploads/2019/05/WFO_Policy_on_Women_in_Agriculture.pdf. Despite the worldwide rise in female-headed households, along with female- headed farms, women are rarely granted land tenure rights and often have less admission to essential production inputs, such as 'land; financial services including credit, savings, insurance, access to markets and storage' (WFO 2019: source https://www.wfo-oma.org/wp-content/uploads/2019/05/WFO_Policy_on_Women_in_Agriculture.pdf). Numerous studies validate that when women can access education, there is a great improvement in their social, physical and economic standing, so they can adeptly provide for their children's education and nutrition (WFO 2019). On behalf of the international community, financial and political

commitments are needed which recognize that gender equality measures will, directly, result in faster rural development. This too will generate economic growth and stability through agricultural-related employment, increased food security and overall well- being of rural populations (WFO 2019).

In the implementation phase of outreach projects, difficulties were documented, such as trees being uprooted and sold by locals after the initial planting.

> *''People need educating while the planting is happening, or they don't see the long-term benefit and look for a quick reward''.*
>
> Interview with the project leader

This has resulted in an education approach to community engagement; with multiple facilitated PDC courses running each year, to aid local farmers to gain ecological planning knowledge that they need before planting trees. The continuous education program also accepts volunteers to stay for extended periods of time. This is an opportunity for those who are serious about learning organic agriculture. Due to the time constraints of farmers, often the PDC is the most time efficient way for the team to deliver foundational training.

Organizing growing syndicates was witnessed as being a component for success, whereby local farmers acknowledge one another's efforts to produce organic yields.

> "Farmers *commit to converting back to organic, then we help get the organic certification for them.''*
>
> In conversation with project lead

Due to the average three-year transition period from non-certified organic to certification, the team suggested the process succeeds by connecting local expertise to wider stakeholder engagement.

> *"The potential of losing an organic license places community pressure on all farms in an area"*

It is observed the collective organic farming responsibility is shared locally. The conventional trade approach to produce and export provides a transition towards exploiting the growing demand for organic produce as a driver for sustainable development of the livelihoods of smallholder farmers.

Box 14: Extract from authors field notes

Sustainable organic farming has obtained support from the government who have the donated warehouse facilities. Although the export model can be viewed as conflicting with the Permaculture model of 'produce and consume locally', the real-time situation sees a high consumer demand for exotic produce in the global north which, at current, must be recognised.

Coconut palm sugar is one of these 'exotic' consumables. Growing with guilds in a tropical forest garden approach, coconut palm trees allow a selection of shorter trees to grow amongst the forest floors, such as bananas, cacao and coffee, all of which have local and international value. The WFO (2019) stresses it as essential to acquire fair proceeds from farming business, as livelihoods in rural areas are poor compared to the cities. This has ensured that the method is less time costly, to maximise yield against farmer's labour and resource input to generate profit, when assessed through Full Cost Accounting. This method has a profit-focused approach towards organic export products. This strategy is listed by Mckenzie and Lemos (2018), as an incentive for farmers to convert back to organic. The process of converting to organic mitigates the vulnerability that can be experienced through climatic changes, together with weak added value for farmers with low producer prices.

Figure 14: Organic coconut palm sugar ready for export, Java Indonesia, Source authors photo.

On an outreach visit to a smallholder farm in Java, conventional farming was observed, following discussions on adapting the land for organic produce. The land had small terracing on steep banks with a large (about 1 acre) almost level field. The field was planted with chillies and mulched with plastic sheeting. In the centre of the land sits a sacred well (described by a local resident), which was often visited by locals.

The team scouted the land, brainstorming ideas of design and hearing limitations of farming options, voiced by the landowner, while viewing the water well and sacred spring running the perimeter of the land. Adjacent to the land, tobacco is grown, which has strong international demand and is consumed locally.

Box 15:Extract from authors field notes.

In the Gunung Kidul area, about 30 mins from Yogyakarta city, is the most recently accepted challenge to expand the enterprise. The challenge is for the team to turn 300 hectares of savannah into jungle. The partnership aims to produce sustainable essential oils, with 60 hectares of land allocated for the planting of the essential oil plants. The initial stages require the planting of kefir, lime, citronella and ceylon cinnamon.

"The agenda is to show people another way of doing business. The land is owned by a company. The community then has the right to work on the designated land on our SOP. We then share the crops - 70% for farmers, 30% for our enterprise".

Interview with owner Omah Lor (2019)

Figure 15: Farm visit, displaying chillies and tobacco. Source authors

In this case, mono cropping is utilised, with the assistance of synthetic fertilizers, to provide produce. The site sits at high altitude and borders the locally respected sacred spring and contains the frequently visited water well.

It is important to understand the religious and cultural relationship with the land that this implies. Beliefs are grounded in ancient animism, yet practices of Hinduism promote an

intrinsic respect for water. This raises questions into how moral or ethical the use of chemicals on site which are deemed sacred by the local community.

Box 16: Extract from authors field notes

In conversation with the project lead and owner, her process of development was stated;

> "*It's fairly simple, identifying what crops have high economic value, then, what habits and culture that would support or against the crop? What is the market like? How to cultivate, harvest, pack, store and distribute the products? And then A list of potential buyers?"*
>
> Interview with project leader

The potential for ecological support roles in Indonesia, based on economically viable crop identification, is shown within the outreach programs of Omah Lor. The importance of generating economic viability was confirmed by the owner. When asked if there is an abundance of sustainable agriculture opportunities, she stated;

> ''Yes, it's about initiating an economical crop".
>
> Interview with Omah Lor owner

Reflecting on the field observation, it would seem that the efforts of cash crop forest gardening throughout Java are extensive in the Yogjakarta region.

Box 17: Extract from authors field notes

In a case study of Javanese forest gardens, referred to as wono dusun (village forest in Javanese) and talon (in Sundanese), Poffenberger (2006) draws attention to villages which boast nearly 200 species of plants. These plants are selected, in order to return to traditional mixtures of species and are grown in multistorey systems. Often these communities commandeer degraded state forests, to establish mixed- forest gardens (Poffenberger, 2006;

Arupa et al., 2004). Due to this method of community-based forest gardening, the study indicated that forest cover in Java increased by almost 6,00,000 hectares in 1997 (Poffenberger 2006).

Figure 16: Highland monoculture farms Java, (source authors)

Permaculture education in the region helps to integrate these methods of forest gardens, by providing participants the skills to assess hydrological functions, suitable species guilds and other components which create the design.

Box 18:Extract from authors field notes

Further outreach programs, from the Yayasan Bringin Foundation and Omah Lor team, reach as far as the Togean islands, where projects are focused upon people who over harvest from the sea and need replacement sustenance. In terms of impact, the team have recorded planting 1200 trees last year, with a vision for more next year. Similar to the policies and goals of the WFO and IFOAM (2019), the owner expressed the need for the effective documentation of recorded activities, from which the process can be replicated. The process of making land productive, to obtain multiple yields, requires education and support. This has been shown, successfully, in the use of demo gardens and through a range of adapted PDCs,

as suggested in an interview with McKenzie (2018). Measuring impacts, generally, is observed to be difficult, due to the numerous holistic beneficiaries.

> *"I realized that is one thing my team is lacking - to document everything, in order to duplicate."*
>
> *Interview with Omah Lor owner*

Although the team, involved with outreach support, were competent in ecological design and cultural tendencies, it was apparent that support within the field of reporting would serve to amplify the team's impact, enabling them to provide measurable and tangible evidence to support impact claims. The problem of data recording was alluded to in a similar discussion with UK based Permaculture educator, S. Jones. Jones commented that data recorded impacts of projects can be a challenge when working holistically. This topic of recording has drawn the attention of affiliated partners of the SDGs. To find the solution to this issue could, potentially, aid in the accomplishment of the wide-ranging targets.

Interestingly, the identification of the severe lack of accounting for impacts could suggest that far more impacts are concurrently happening, untracked. The lack of financial support or resources, such as funded personnel, limit the extent to which projects record and replicate.

Box 19:Extract from authors field notes

This point coincides with what is echoed in the agendas of IFOAM (2019) and the WFO (2019) whose collective programs feed directly into the SDG goals as part of the Famer Majors Group.

Growing the Knowledge Base

In recent years, online forums have become the tool for knowledge share and discussion (Luchkina 2016). When discussing such tools, discrimination became a key theme of conversation between the author and some of the team members. Mention was made of open dialogues in the public online forum 'Permaculture Asia.' Within the forum, distinction is made between groups through terminology, such as "supremacies and the unfortunates". It was further expressed how individuals, and enterprises discriminate against others by not giving equal opportunity to education exposure.

"I met the Indonesians who got scholarships for the PDC, and how they were treated not equally as the foreigners'

Authors Interview anonymous participant (2017)

Although this is a worthy reported case, I recognize this may be an individual case or isolated example and cannot verify a national trend, without extensive research into the Permaculture PDCs on offer throughout the region. The extent of Permaculture facilitators executing PDCs in Indonesia is extensive and each PDC experience is generally unique to the space, participants and energy present on the occasion. Many factors can be responsible for the perceived exclusion or inclusion of participants, such as affordability and resources availability to deliver effective training.

Box 20 :Extract from authors field notes

Non-state education, such as the PDC, is often reliant upon the support of Non-Profit or private arrangements, adding complexity. Interviews with community members gave insight into to the reason why land stewards face limitations, in relation to Permaculture education;

Farmers are often limited by time to attend courses, because they are needed to manage the land

Box 21: Extract from authors field notes in discussion with attendees of PDC.

The effects of education access, time availability, network links and geographical residence can form a reliance upon non-profit infrastructure.

Box 22:Extract from authors field notes

Figure 17: Grey water biological management at a smallholding Yogyakarta.

(Source authors photo)

On a visit to a homestead on the outskirts of Jogjakarta, Permaculture practice and efforts of sustainable development were observed, as small homes were not connected to 'the mains grid', were self-reliant for food, and were expected to manage their own waste. As shown in Figure 17, as one family's Grey water system, which processes the household wastewater, is held in a small lined pond of wetland plants before being used to irrigate a terraced garden.

Figure 18: Biochar production technique in Yogyakarta Indonesia

(Source: author observing Biochar production technique in Yogyakarta Indonesia used for improving Permaculture-farming functionality).

Due to poor soil quality, the team at Omar Lor focus their attention towards improving soil quality. The methods of achieving this are taught on the PDC at the centre. A technique showing how soil is improved on the site, with biochar, was observed. This, effectively, communicated an interesting, safe and simple method.

Soil improvements are assisted at Omah Lor with the use of biochar production, which is demonstrated in a workshop. This process uses the waste from one crop, 'rice husk' in this case, as the carbon source in the charring process. The method uses a simple design, constructed from a welded metal box drilled with holes for suction and an attached chimney. A fire is started with a small amount of sticks, then covered over with the metal box. Once the fire has established, the box is smothered with twelve bags of rice husk and allowed to slowly

burn. The pile is turned, when necessary, to avoid over charring. The biochar, when finished, is allowed to cool before adding the compost soil additive mixtures.

Box 23:Extract from field notes

Previously evidenced in the literature, biochar has been found all-over the globe, including in biodiverse ecosystems, such as the amazon rainforest (Harden 2010). It is a fundamental component to the swidden techniques of 'slash and burn' approaches in tropical agroforestry cultivation (Poffenberger 2006). The method above, however, alleviates the requirement of burning sections of forested areas and, instead, produces the soil additive in a controlled manner. It is generated from what would alternatively be waste bi product.

On completion of the biochar, the team moved on to constructing a banana circle, which consists of a meter-deep circle around 2-3 meters wide. The soil is placed as a mound on the perimeter and layered with biochar. Papaya and bananas are then planted and are edged with vetiver grass to stabilize the mound. The central pit is used to compost the foliage of the garden. This may pose a risk when handling, due to thorny shrubs.

Box 24:Extract from field notes

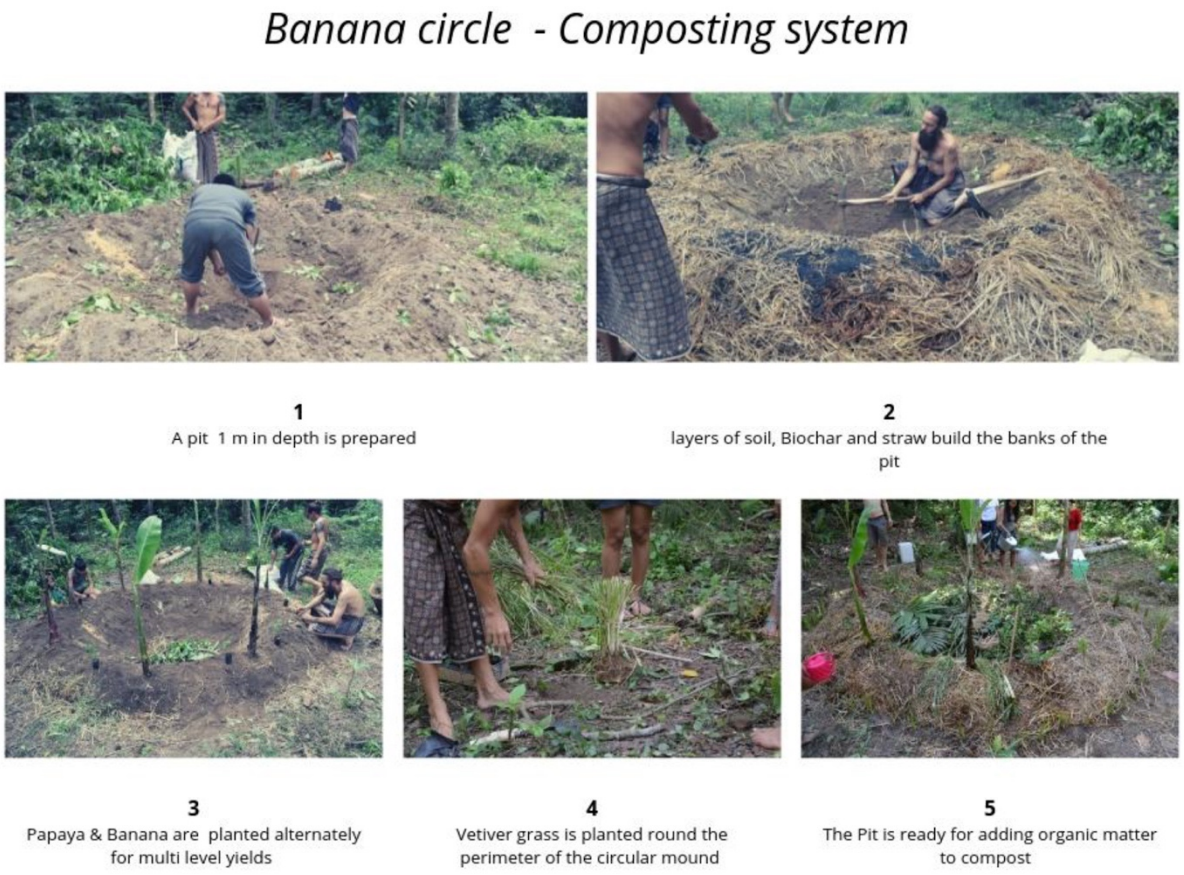

Figure 19: Process of creating a Banana circle, forest garden guild for composting. (Source: authors)

One year later, in a discussion with the owner of Omah Lor, it was important to collect feedback on the productivity of the banana circle method which had been constructed;

> *"It's very fertile soil around that banana circle, and I have been harvesting banana trees from it as well, to make hot compost and mulch''.*

Interviews with Omah Lor Owner

Soil Quality

The effects of soil depletion can be witnessed in the current global epidemic of desertification. In recent years, however, the rediscovered knowledge of organic soil construction has alleviated anxieties surrounding soil depletion. In the text 'Teaming with microbes', Lowenfels & Lewis (2010) compile the biological complexities of the soil food web and manipulation techniques, in which cultivating microbes can transform a space. Technological

advancements, such as aerated activated compost teas, are a fundamental tool used to increase soil biodiversity and fertility (Lowenfels and Lewis, 2010). Increased biodiversity of organic matter and forming hummus layers of soil is paramount for rhizome functionality and nutrient uptake and can be manipulated to suit ideal -crop conditions throughout the seasons (Lowenfels and Lewis 2010). Intensive soil biology cultivation is supported in primary production industries, using Korean Natural Farming (KNF). KNF is a developed system of natural farming and is based on generations of sustainable farming methods practiced throughout Japan, China and Korea. Through this system, maintenance of nutrient input and outputs are balanced to minimize detrimental effects on the environment (Miller *et al* 2013). More specifically, it encourages the cultivation of indigenous microorganisms. This is achieved via methods, such as fermented plant juice for the production of crops and animals. The system aims to move toward self- sufficiency and away from reliance upon imported inputs like fertilizer (Miller *et al* 2013). Many methods of soil creation and building are used throughout the Omar Lor site, actively assisting in providing organic plant nutrition. Nutritious soil generation is also advocated in the interconnected systems approach, as explained in Crawford's 'Forest Gardens' (Crawford 2010). This approach works to actively store carbon in the soil and alleviate waste. Many benefits can be found in the composting of localised systems. It is beneficial for local people, but also provides benefits which support the global policy agenda, such as the reduction of fuel use and the laborious and intensive mining for fertilisers.

Permaculture Education

Interestingly, when discussing Permaculture education and PDCs, there is a distinct aversion to the accreditation model used in the UK. It is widely known that the use of the word 'Permaculture' is reserved for PDC graduates and members of the Institute, stated by Mollison (1988). A pivotal honest query was asked in discussion with an anonymous teacher:

> *"Why do we have to go through accreditation?*
>
> *''It seems that PDCs have become a business. If the accreditation is for free, sure I will get one. It has membership fees, for what? So that the*

teachers must join the Permaculture Association so that they can use their certificate template.

Interview with anonymous teacher

In further discussions with the Permaculture association UK, the topic of accreditation was approached, in which arguments for the process of teacher training accreditation were emphasized, such as the lack of PDC consistency and quality of teachers. In Mollisons' (1988) manual, he states the word Permaculture can be used by anybody adhering to the ethics and principles, with restrictions on teaching. Only graduates of a Permaculture Institute can teach 'Permaculture' to an agreed upon curriculum which is reviewed and developed by the College of Graduates of the Institute. In deeper discussions with the team, reference to the 'old ways' and traditional forest management methods peaked interest. The understanding and viewpoint of interconnected ecological systems is not a new concept to many land stewards throughout the Java region, however, insights into the 'gap' in ancestral knowledge were voiced in conversation with locals.

'It only takes one generation to not pass on the knowledge and then it is lost. Lots of the last generation were convinced to use fertilizers and then they forgot how to manage the land without it.'

An informal conversation with a farm volunteer in West Java

Although 'Permaculture' has been formalised fairly recently, the ancestral ways of indigenous cultures and their relationship with their environment is what Mollison (1988) identified and intended to re-ignite through education. This is suggested by his reference to, and experience of, Australian aboriginal people and their traditional way of life. These forgotten ancestral methods are communicated and re-imagined in a PDC.

Other organizations, such as Permatil, operational in Timor, have adapted their educational delivery of Permaculture. The prerequisite traditional 72-hour PDC was identified to, at times, be a barrier to equality, as this commitment limited the attendance of women, and isolated the potential of farmers to attend due to other commitments. Mckenzie referenced Permatils

efforts towards disaster resilience and the importance of spring protection management as a core focus to engage communities.

> *'Demonstration farms have also been a focus, yet over time they end up unmanaged. People thought this was a bad thing, but it's generally because farmers who have visited are adapting their methods and using the Permaculture teachings after seeing a successful model. So, then there isn't much need for the demo farm'.*
>
> Interview with McKenzie (2019)

McKenzie also highlights farmers' initial concerns to convert farms and livelihoods into complete Permaculture designs, as surrounding the gradual nature of conversion. Similarly, demonstration sites work when they are sculpted by an education focus, removing the dependency on crop yields at the training centre.

In discussion with McKenzie, the presence of a gap between NGOs and Permaculture projects was acknowledged, in a similar context to the gap echoed between natural and social sciences studied by Fox et al (2006). McKenzie also suggests the use of SDGs as a 'pattern language' has assisted effective partnerships between NGOS, with similar agendas. Supporting this point Fox et al 2006 continues, 'Opportunities to integrate social science techniques into conservation practice have been promoted by nongovernmental organizations (Chornesky et al. 2001; Community Conservation Coalition 2003, cited by Fox et al 2006), government agencies (Machlis 1996 cited in Fox et al 2006), and academia' (Noss 1997 cited in Fox et al 2006).

> *"In Indonesia we notice multiple partnerships between NGOs with similar agendas, it was noted that SDGs are generally a pattern language'.*
>
> Interview with McKenzie (2019)

Mckenzie acknowledges how these agendas can be met through the adoption of Permaculture, however, advises project leads to match the language patterns of grant proposals and to refrain from using the term; 'Permaculture.' In doing so, they will have wider appeal to funding segments. In order for Permaculture to have increased impact, McKenzie suggests that Permaculture can influence international development of policies by accepting holistic methods, such as Agro-ecology (which has been proven effective by many active NGOs) and operate under the umbrella of Community Forest Management. The successful development of Permaculture into the primary school curriculum aims to do just this.

Box 25: Extract from authors notes

Figure 20:Researcher at a coconut palm sugar farm 2017 Source: researchers

Rivers

During observation, the researcher was made aware of multiple functions served by the rivers, such as bathing, washing clothes, irrigation, leisure and religious practice. In a later interview with Permatil associate, McKenzie, it was found that the stabilization and management of springs were of crucial importance to projects in Timor and other areas of Indonesia. Similarly, from observation, it was apparent that individuals up and down stream had diverse uses for the river. Little is known of the uses further upstream by the land management, this leads to concern over detrimental effects associated with unknown sources of contamination. This was an issue also raised in the UK. On the researcher's previous organic farm visits, farmers noticed increased nitrate levels in water tests. They had little explanation for the cause, however, on further enquiry, it was found that farmers up-river spray a magnitude of chemical fertilizers. Due to the enormity of rainfall in the wet season the owner identified a continued struggle for the riverside farm.

> *"We already put a retaining wall, the water never goes all the way up to the farm, but it washed away 2 meters of soil, so we built 40 meters retaining wall, and fill up soil in between the wall and the land".*
>
> Interview with the Owner of Omah Lor

This preparation for damage avoidance is crucial to avoid soil erosion and land loss throughout the wet season, and, in this case, gabion baskets filled with rocks retain the collapsing wall. The forest garden approach of planting substantial polycultures around riverbank slopes to improve hydrological functions is evident, and in water prone areas bamboo is encouraged to take hold for stabilisation control.

Figure 21: 40-meter riverbank gabion basket retaining wall. Source: Omah Lor owner

Bank stabilization allows for the further adaptation and development of water systems, which focus on controlling the inputs and outputs of water movement, to prevent damage, but more importantly, maximize yields.

Figure 22: Fish farm and raised beds on the edge of the riverbank. Source: Omah Lor owners

The wet zone arose from flooding and was directed by a designed system. The system was designed to harness the water before it re-joined the river, serving as a wetland filtration system. The small fish farm, shown in Figure 22, manages the soil saturation of the preceding raised beds. Elevated raised beds mitigate the risk of crop disturbance.

> *"Sand and pebbles filter already in place. It also will have wet land for filter, with lots of edible water plants, fish, snails and frogs; one third of the pool would be wet land".*
>
> Omah Lor owner (2018)

Summary of The Jungle in the City: Tropical Permaculture

The observational account of permaculture actors within the Yogyakarta area of Java uncovered a productive system which utilises education such as the permaculture design course to empower local primary food producers. Perennial food forests are promoted in design thinking which also carry commercial potential to provide growers with not only personal sustenance, but a living income.

Regenerative education is observed to be critical for the assistance of the related SDGs. The reach and impact of the PDC, held at Omah Lor evidenced how the grassroot movement has assisted enterprises regenerate their own community, starting with local economies and environmental settings.

Discrepancy has been highlighted as to the different cultural value sets and beliefs within the permaculture global north and global south, which calls for the need to take these into account when bridging local communities and major groups. This is another appeal for effective cross-cultural communication and models which support this. Disparities within the permaculture community regarding accreditation for PDCs in Indonesia stimulated a resistance by local practitioners, who chose to distribute permaculture knowledge through teaching. Interesting arguments were heard as to why the accreditation model seems restrictive towards the spread of permaculture within the area. Despite this intercultural discrepancy between permaculture actors, the continuation of PDCs and permaculture

outreach projects in nearby communities shows promising direction towards a regenerative culture.

Crisis risk management was observed to be factored into the design process such as, earthquake proof buildings, insurance polyculture crops, river flow management, and soil erosion mitigation.

Many techniques related to sustainable living were observed, such as building soils, natural constructions, managing waste, and regenerative agriculture, all of which have strong influence on holistically attaining the SDGs.

SDGs observed to be applicable within Omah Lor:

Goal 1: No poverty
Goal 2: Zero hunger
Goal 3: Health and wellbeing
Goal 4: Quality education
Goal 5: Gender equality
Goal 6: Clean water
Goal 8: Decent work and economic growth
Goal 9: Build industry, innovation and infrastructure
Goal 10: Reduced inequalities
Goal 11: Sustainable cities and communities
Goal 12: Responsible consumption and production
Goal 13: climate action
Goal 14: life below water
Goal 15: Life on land

Box 26: Extract from authors field notes

CHAPTER 5

The Accounts of Global Actors

The following case studies were conducted to understand Permaculture applications in the field, potential benefits to assimilation and thoughts of permaculture actors in regard to its mainstreaming, pros, cons, needs and barriers. Case studies and interviews are present from the Global North and Global South.

This chapter documents interviews with the author's selected stakeholders whose actions were deemed relevant to the overall study. The discussions are diverse and probe into their drivers, projects, historical backgrounds and themes of applicability in the mobilisation of sustainable development. The next three case studies give evidence toward permaculture discourses directly in the sustainable development arena.

Initially explorative interviews with Mike Smith, from the 'Incredible Farm Todmorden', discuss the relocation of the farm to facilitate deeper social impact and the application of Permaculture principles.

Secondly Steve Jones, founding partner of Sector 39: A Permaculture education enterprise, shares his efforts, in relation to education in North Wales and his refugee support in Uganda, Jones, diverse account gives examples of permaculture actions in cross-cultural settings from the Global North and Global South. Thirdly, UNSDGs youth spokesman for Uganda, Charles Mugarura, shares his account of his efforts to facilitate the SDGS through Permaculture acceleration throughout schools in Uganda and women's empowerment.

Incredible Farm

An interview with Mike Smith Todmorden, UK

Returning to the author's home region, a small holding community farm has practiced the principles of Permaculture, developing a movement entitled 'Beyond Organic Farming'. Initially linked to the Incredible Edible Todmorden Movement, the message of 'Plant Veg, Grow a Revolution' (Warhurst, and Dobson 2014) has seen a frenzy of academic, education expert and tourist pilgrimaging from countries such as Sweden, Japan, Venezuela and New Zealand, to experience the Transition Town epicentre of the growing rebellion.

> *"Now people come from all over the world to witness the revolution that we call Incredible Edible Todmorden "*
>
> Warhurst, and Dobson (2014: xiv)

In recent years, the recognised 'Incredible farm', located in Todmorden, Northwest UK, has undergone massive change. Over the past two years, the farm has relocated from its foundation site to a new location in the same valley. The initial start-up, known for its pioneering social-agricultural enterprise in an unlikely location, was initially developed on donated land from a local garden centre, in an urban village and was surrounded by grazing land. The town is most famously known for its 'propaganda planting'. This term was coined by Warhurst and Dobson (2014: xiv) who clarify how the 'radical act of growing food, became the starting point for transforming every aspect of the town'. This revived the town from its economic slump, following the decline of textile manufacturing after the second world war.
In a similar vein to what Lafferty & Eckerberg (2013) claim, Agenda 21 aimed to accomplish, through localisation, the urgent needs of the collective;

> *"How do we ensure a secure future for our children and grandchildren?"*
>
> Warhurst, and Dobson (2014: xiv)

The crisis of the looming peak oil crisis instilled a sense of local community responsibility, yet Warhurst and Dobson (2014: xv) explain how orchestrating a mass movement towards

localisation was lacking a unifying language, which could bridge the barriers between age, income and culture. Eventually, the realisation dawned that the common language was that of 'food'.

> *"Up on the hills that surround our town, the farmers are discovering that all this growing is good for business. As local people get more interested in where their food comes from, producers have been inspired to bring out new lines, like an award-winning cheese, and sausages from rare breed pigs.'*
>
> Warhurst, and Dobson (2014:xiv).

Figure 23: Incredible Farm produce for sale

Source:(https://www.facebook.com/IncredibleFarm/photos/a.491594597575915/2300791613322862).

Birthed from the movement, the initial farm grew from the efforts of Nick Green who was instrumental in the development of the IE movement from the beginning. His early project, in Waldsen, was renamed the 'Incredible Farm' which swiftly earned grant support to employ the 'indispensable Michael Smith' (Warhurst, and Dobson (2014, p.237). Smith kindly gave his account to this study. From the early days. the agenda of creating apprenticeships for young people embodied the movement's ethos which Warhurst and Dobson (2014, p.237) hoped would replicate, as the skills learned would enable apprentices to, one day, 'create businesses of their own and train others the lost art of growing food and animal husbandry'.

Today, the Incredible Farm is a distinctive project, offering inspiring activities to engage and teach all ages about building a sustainable food future. Foundationally, Incredible Farm is a stand-alone, not-for-profit, social enterprise. The project is operated by the same personnel and is under the same brand. The foundational manifesto, ethos and operations, remain the same, yet the location has changed. Unfortunately, due to a change of circumstance, the land gifted to the enterprise was retracted, forcing the operation to move to a larger site. This has also led to the case study being split into a two-part scenario:

1. The original pilot 1-acre farm.
2. The new 15-acre farm (5.7HA) site altitude is between 207m and 260m.

The Original Pilot Farm

From observation; the site boasted a vast array of edible greens and British fruit for local commercial produce and stocked some of the local restaurants. The facility sat on a one-acre area in the base of the valley, housing a small selection of animals, such as pigs and cows. The farm used methods, such as grazing with pigs, for land clearance and soil preparation. While many participants engaged with the centre, it had a relatively small team driving the operations.

Box 27: Extract from authors field notes

The New Farm

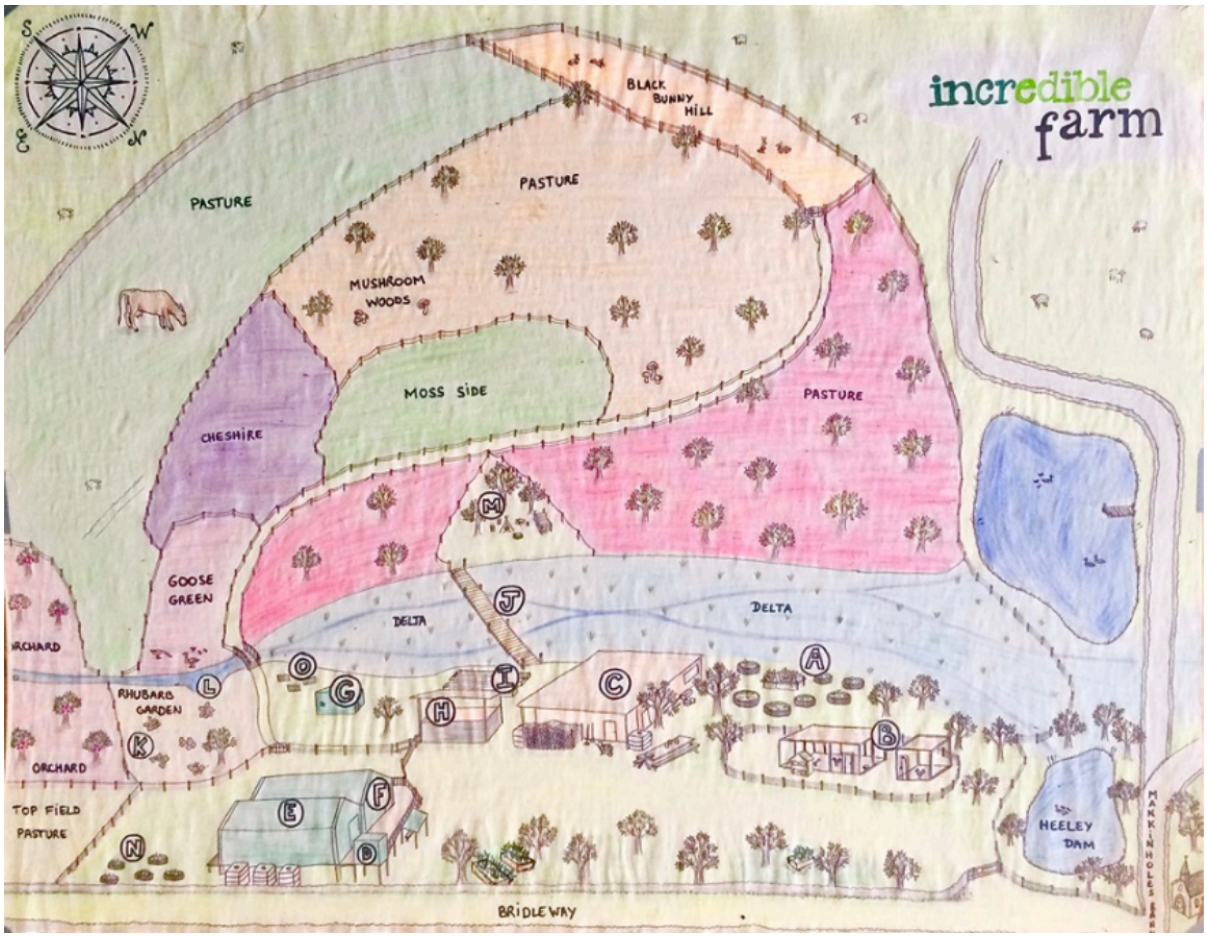

Figure 24 Incredible Farm site map by intern Lucile Boulan (https://www.facebook.com/IncredibleFarm/photos/a.436006159801426/2360857177316305)

From the early days, the community aspect governed how the Incredible Farm laid the way for success, offering apprentices a range of experiences and creating a team atmosphere. An apprentice's account was noted.

> *'I am learning how all our jobs at Incredible Edible Farm fit together into an ecology that gives me a real sense that I am not working as a lonely cog in an obscure machine that is part of a silly game. The farm seems like a living lesson and because the line between*

classroom and food forest is pleasingly blurred, we can eat, smell and touch our education.'

Apprentice at the Incredible Farm; Warhurst and Dobson (2014, p.238).

When discussing farming methods, Smith mentions how the team 'embrace complexity, using Permaculture, regenerative agriculture and agroforestry.' This assists in building biodiversity. The farm is home to; frogs, toads, newts (huge population), badgers, foxes, rabbits, curlews, willow warblers, rare twite (on the adjacent moorland, Langfield Common) and peregrines. The agro-forestry boasts a variety of tree species, including; alder, ash, birch, crab apple, oak, hawthorn, rowan and willow. These were planted by Treesponsibility, in 2007. The rows of trees are planted just off contour and are widely spaced to plant crops between.

The 'Incredible farm' continues to hold weekend activities for local residents. These include 'young farmers days', where youths attend to learn the skills of sustainable food production and land management. Initially, this was one of the primary aims for instigating the project and is still so.

"Teaching children is key, I noticed how deeply disconnected they were to being outside, some barely able to walk on uneven surfaces. Once they are disconnected, they stay that way till adults, that's why kids work is so important''

Authors Interview with Smith

Offering a solution to the perceived epidemic of the detachment from nature, Smith facilitates a 'Forest Garden Schools' program, developed for home-schooling families who aim to integrate social education in a natural environment. The drive for including 'early years children' in nature-based activities has led Smith to facilitate multiple programs and lessons, alongside the implementation of gardens in the local schools. He dedicates many hours per week to teaching and the development of these edible school gardens.

The outcomes of the farm resonate with Smith's personal views on education and the requirements for connection to nature. This also coincides with the message of Weisberger

(2013), who discusses culture as being the direct result of man's interaction with the environment around them. In a recent online announcement, the farm plea for the community to get involved, in order to stimulate engagement, focussed upon the benefits for children, specifically.

> *"Importantly, people on the land, not just walking past, but engaging with the complexity, the detail, the life that our great grandparents had, but with a wider perspective, more possibilities, more appreciation. And children that had so much fun in nature that they became its guardians".*
>
> *Smith Blog post* (Source instagram.com/incredibleedibletodmorden)

Personnel

Through its progression, several apprentices have aided the site over the last 5 years, each helping with development and maintenance. The approach to developing accredited knowledge, in preparation for employment, has seen the project earn grants, including Ernest Cook Trust, with support from the Pennine Housing and the Leeds Enterprise Partnership (AGE). This enabled Incredible Farm to hire apprentices as full-time staff. Trainees develop core skills and knowledge of the land and learn how to grow and sell food. Typically, guidance is given to apprentices 3-4 days a week and is facilitated by the 'Head Grower'.

A funding requirement, of the above grant, limits the employability potential of the farm to one person per 18 months. Another component of the incredible edible farm is WWOOFing. WWOOFing allows for placements during which participants exchange time and assistance for education and accommodation. This attracts people from all over the world.

> *"Volunteers are great as they bring lots of energy, but it often means retraining which takes a lot of time and energy "*
>
> Interview with Smith

Smith expresses the struggles of having limited personnel at the enterprise, due to volunteers changing regularly, which causes strain and requires a constant input of resources for training and mentoring.

Box 28: Extract from authors field notes

Background, Purpose and Implementation

Incredible Farm manifesto and goals:

- *Produce and sell food with minimal impact on the environment, using Permaculture methods.*
- *Self-finance by generating income from produce, plant and fruit tree sales and from training.*
- *Explore and model the idea that it is possible to make a career in growing food.*
- *Provide opportunities for the local community to come together and learn about growing food, agriculture and sustainable living*

Source: (https://incrediblefarm.co.uk)

At its core, the original incredible farm reclaimed unused land that was serving very little environmental, economic or social benefit. The visionary exploit harnesses the niche of organic produce and what is echoed throughout the towns and villages of the UK, as expressed by multiple citizens, to 'spend local' (Warhurst and Dobson 2014, p.4). Through the Incredible Edible defiant social movement towards self-reliance, the Incredible Edible brand showed interest in numerous urban agriculture methods (Warhurst and Dobson 2014, p.4). The incredible farm holds strong foundations in soil raised plants, capitalizing on the cultivation and sale of heirloom fruit trees and alluring tree grafts.

"Over the past 9 years we have grafted between 200-700 fruit trees per year, usually between January and March''

The sale of fruit trees is an additional product, which assists the financing of the farm and provides a steady regular income. In addition, the grafting and propagating of trees for use throughout the farm reduces costs and provides resilience, whilst maximising yields and diversity.

Figure 25: Mike Smith at the Incredible Farm demonstrating silvopasture and forest gardens.

Image source : (instagram.com/incredibleedibletodmorden)

"Grazing quality is very poor, due to permanently wet acid grassland. The steep hillside is prone to landslides which is aided by rabbit burrowing activity. We keep some dairy cows and geese, which only get to eat grass. Pigs do the ploughing for us and get to use up farm waste products, like whey from cheese making and the more wonky of veg. Our practices are beyond Organic."

Smith 2019, retrieved from www.instagram.com/incredibleedibletodmorden)

Observing the permaculture principles 'produce no waste', and 'obtain a yield' is shown around the farm by matching key functions of animal with other components in the system. This aspect of interconnected design thinking supports, SDGs related to reducing hunger, sustainable communities, responsible consumption and production and life on land.

Box 29: Extract from field notes

The method of Forest Gardening is utilised throughout the farm's agroecology zones. In a recent forum post Smith informs as to the reasoning behind this regenerative mode of zone, sector planning.

" SilvoPasture or agroforestry is an old practice of grazing under trees. It's a form of agroecology. It's the future of sustainable farming. Agro-ecology focuses on creating diverse ecosystems that provide long term benefit for both humans and the local ecology with resources such as food, fibre and fuel and habitat. This practice creates a richer ecosystem when compared to the more dominant practice of mono-grazing, which we see all too often around our Caldervalley and beyond. Many sheep nibble constantly on a flat, barren landscape, which, unfortunately, results in the erosion we see around our famous Stoodley Pike monument. By providing a more diverse ecosystem for the cows to graze, with a mix of trees and shrubs to eat, more carbon can be captured and stored, more resources are available to harvest, more

biodiversity can exist amongst the land creating a more resilient and sustainable landscape for all."

(Smith 2019, retrieved from www.instagram.com/incredibleedibletodmorden)

At the new 'Incredible' location, the enterprise has expanded onto 15 acres. Smith explains how non-formalised agreements have been an 'unfortunate turnout of events', resulting in the requirement to move site, however, the new expansion allows for the experience of how the pilot site translates to create the framework for success at the new site. The jump in scale was planned for a period of around six years. This allowed for a lengthy ecological design process to ensure that the site was well planned. Smith explains, it is vitally important 'to be careful of how much they take on, as lots of things seem to come at once'.

For small enterprises, it is apparent how the multidisciplinary nature of running a business and implementing the practical day to day operations can overstretch resources, especially personnel.

Box 30:Extract from field notes

Figure 26: Smith teaching on the 'young forest gardeners' program at the Incredible Farm. Source (https://www.facebook.com/IncredibleFarm/photos/a.436006159801426/2520463781355643)

In light of the global climate situation, documentaries, such as the infamous 'Demain' (Tomorrow), have drawn attention to the UK's crusading of Transition towns which have geared citizens towards social and climate activism. Connors and McDonald (2010) have explored transition towns extensively. They argue that the Transition Town (TT) movement is a 'global phenomenon', assisting communities to create self-reliant futures post peak oil. In the context of this UK region, Smith says, 'the community have been granted permission to take over the local college, which is to now provide courses on sustainable building through partnerships, such as straw bale building'. The TT movement has also created the pull towards

producing food, which became a core component of neighbours working together. Although associated primarily with food, the 'spin off' social enterprise, Incredible Farm, has developed an extensive local network associated with the 'Incredible Edible' brand, presenting a mode of social networking offline through producer consumer relationships. It has drawn attention to local economic resilience (Adams, Barker and Beesley 2019), whilst supporting the uptake of local food resilience. The extent of the impacts of Incredible Edible Todmorden (IET) are explored, more recently, by Hardman, Adams, Barker and Beesley (2019) in which findings revealed that the scheme has an overwhelmingly positive impact on the town, with social, environmental and economic benefits. Although, the farm importantly clarifies that it is a social enterprise spin off of the mother brand.

Addressing Food Security

The concern of food security is often overlooked in the global north, however, according to DEFRA (2002), around 70% of UK food is imported from abroad. Responding to this, the Incredible Farms plan for the long term, through soil building and ecological design, to provide a solution to the concerns suggested in Enrlich *et al* (1993). These concerns pertain to the food producer's capacity to keep up with population growth, and the need to alleviate the dependency on importation, at a local level. Discerning the impact of these practices, in relation to the economic slump in the area, Warhurst and Dobson (2014, p.3) speak of the recent food revolution, stimulated in Todmorden and liken it to be similar in approach to the allied forces throughout the world wars, at least in regard to communication strategy, were 'cultivation for victory' was publicised as propaganda to, not only feed the nation, but spread a political message (Gowdy-Wygant, 2013). Interestingly, in a similar context, to that created by international dependency, recent political uncertainties surrounding the UKs decision to exit the European Union have, inherently, uncertain consequences for the food sector. This has been raised and explored by multiple researchers, such as Lang and Schoen (2016) who debate the potential effects of these complex issues upon food sovereignty.

The case of the Incredible Farm, TT movement can be viewed as a prospective regional approach towards food security which has been built outside of national governance. This raises questions as to the importance and capability of NGO inputs surrounding national food security. The importance of NGO input for food security is emphasized by Hardman

(2012). Hardman suggests the roles of these organisations can facilitate the transition, where principle governance fails.

Observations of food production, volumes and quality were noticeably impressive throughout the stages of the farm's development. The diversity and consistency of the produce from the 'farm to table' operation is constantly scaling and adapting to consumer demands. In 2019 they predict an income of 8000 GBP from fresh produce sales. Forest garden planting is a long-term strategy and will continue to increase yields and diversity year on year.

Box 31:Extract from authors field notes

Common observations are made during times of flooding. Noticeable topsoil deposits can be seen throughout the destroyed towns. In discussion with Smith, the topic of land management was approached;

> *'The issue of vast Moreland is obvious and we are right in the middle of the debate, the first thing I show people who come to the farm is the structural difference between the forested microclimates and the surrounding sheep grazed pastures which is causing the soil erosion'*
>
> Interview with Smith (2019)

Enquiry into the methods of land management in the surrounding areas suggests the inability for ecosystems to cope with the amount of rainfall at peak times. Interviewing local residents identified the consequences of deforestation, and subsidized livestock farming in the upper valleys as preventing sufficient soil cover crops from establishing natural succession. It is through natural succession that the forests effectively protect soils, by holding water in the ground. In the new IF geographical area, the polarity between traditional farmland management and the alternative interconnected systems approach is starkly conveyed.

In a conversation with Smith, the method of agroforestry was mentioned. It highlights how natural systems assist the farm to effectively manage water and prevent flooding or waterlogging.

'The trees increase soil water absorbency, cycle nutrients, fix atmospheric nitrogen, some produce fruit and nuts, provide shelter from wind, structural wood, firewood and wildlife habitat.'

Interview with Smith

It should be noted, these areas are historic mill towns, among rolling valleys and are remnants of the industrial revolution, harbouring flowing rivers which once gave power to core facilities (Darke 1995). In this particular area, the river has a history of flooding, resulting in the town centre suffering regular extensive damage (Hebden Bridge). During these catastrophic events, such as the 2015 flood (Forrest, Trell & Woltjer 2019), the social bond and communal responsibility flourished under the pressure. This was observed by the researcher.

There is a real sense of community in the chaos, the clean-up of the streets has been non-stop, Food is being donated, cooked and supplied in the centre of town to feed the clean-up party. The same influential faces of the TT, IET and Incredible Farm social growing movements are orchestrating resources and helping to manage the efforts.

Box 32:Extract from the authors field notes

Summary of Incredible Farm

The localised ethos of this case study presents convincing evidence of the impact of social enterprise in the global north. Answering to many of the SDGs, the small farm utilises limited resources, yet continuously involves the surrounding community to generate a greater understanding of the environment and food security. Evidence identifies the commercial potential of localised food systems within the U.K, as the farm promotes 'farm to table' philosophies thereby reducing food miles.

Through continuous education and outreach, it was observed the impact on the community exceeds the farms logistical boundary, as local groups take up support for localised growing systems.

Steven Jones, Sector39 Founder and Director

Steve Jones is from a farming background and studied a mix of economics and ecology at university: Sustainable Development. First understanding the global situation was due to the ecological crisis in 1984, Jones has been working hard to find creative solutions, ever since his graduation in 1984.

Jones explained how he was ‘dissatisfied with opportunities in the UK in the 1980s.’ He went to Zimbabwe and was immersed in the emergent Permaculture and regenerative agriculture scene there, which was ‘vibrant, full of optimism and opportunity’. Learning many new skills, he identified new possibilities. In 1994, two years after the '92 Rio summit, he realised that working in mainstream education, at that time, was not the best course of action to create the change, after experiencing the alternative steps which were required for the journey. This resulted in him establishing a Permaculture themed intentional community in Wales. This became his home for many years and was a testing ground for many Permaculture related ideas. He says that this is ‘the bedrock of his experience’.

During that time, Jones also worked at the Centre for Alternative Technology in Machynlleth. He worked there for 7 years, immersing himself in the environmental world and gaining skills and contacts. In the early 2000's, Jones inaugurated the Permaculture consultancy and teaching enterprise, Sector39.

> *“What I have learned is this; capitalism is flawed as it does not value ecological repair or bear the cost of the environmental and social damage it causes; it has no ethical steering mechanism. Permaculture design by contrast is based on ethics that seek to expand productivity whilst also building soils and enhancing biodiversity, it is regenerative. Production in harmony with community and environment, not at the expense of it. Yes, it is possible, and I have experienced how well it works on many occasions.*
>
> *As a community we have stepped outside the mainstream economic models to create a series of ecological and affordable housing co-operatives, using low interest, ethically sourced loans. Tenants managing their own*

housing can invest in energy efficient and renewable generation as a priority, not an afterthought".

Jones (2019) email statement on co-operatives

In a similar supporting context to the issues raised by Johnson, (2009: 4) on food security, Jones declares, localised food production was the next natural area of investigation, however suggests, "we did this in Newtown Powys, teaming up with a local waste management company that made compos*t* from food waste.

"We developed a community farming model that utilised neglected urban and suburban spaces, bringing them into productivity using strictly organic methods."

Interview with Jones (2019)

Interestingly, this angle of sustainable local agriculture has many benefits which are often associated with food security, *(*Johnson, 2009: 4), sustainability (Holmgren 2007), and healthy lifestyles (Von Brauen *et al*., 1992) and is a fundamental aspect alluded to in the localisation theory of Agenda 21.

"*We know we can't feed whole cities like this but if we can generate fruit and veg on a scale that supplies maybe 30 - 50% of local need, using only the waste-flows within settlement then we can greatly reduce waste, eradicate food poverty and build a much more interconnected community at the same time.* "

Interview with Jones (2019)

Jones' pragmatic realism of the global ecological crisis is very direct and unwavering, yet very open and non-judgemental. Despite the conversation's deep context, the interaction is light and optimistic in regard to the recent events such as the global school strikes for climate change.

Box 33: Extract from authors observation notes with Jones 2019

Sector 39 and Permaculture Design

Currently, Sector39's work has two strands, one working with the local high school which is funded by the EU, and the other working with partners in East Africa. The initiatives are developing curriculum-based teaching resources that address the Paris commitments, in response to the climate emergency and to show schools a way toward meaningful action beyond scary rhetoric alone.

Returning to Africa in 2014, Sector 39 have linked with grass roots farmer networks in Uganda, Rwanda and Kenya. They had been teaching a series of Permaculture courses there, before winning a 6-month contract in 2018, to teach Permaculture as a tool for resilience to South Sudanese refugees in the North of the Country.

The work and process of Sector 39 offers priceless insight into the next steps for both local and global responses to the climate challenge. In addition, Jones ascertains a rising crisis in farming in the west, stating:

> "*Our food production models are not resilient to climate disruption or unstable energy supply and costs. The reality of rapidly vanishing biodiversity desperately needs addressing too. We urgently need to form strong coalitions of partners, who have the vision and drive to create new approaches, new opportunities, viable alternatives that address the root causes of our problems.* "
>
> Statement via email from Jones (2019)

Due to the rapidly growing network of the organization, Sector 39 is seeking investors for bold new projects in their pipeline, affirming, "their network of highly motivated individuals is dedicated to creating positive change."

Sector 39 are continuously extending support to overseas efforts, in the East Africa region. More recently, they assisted in the implementation of the East African Permaculture Convergence, held in 2018. As a result of this successful enterprise, Jones has been able to provide valuable information, regarding the experience of delivering Permaculture design courses in the Sudanese refugee camps of Uganda, alongside support from rural farmers.

Permaculture in Refugee Camps.

Moving on to Jones' most recent work in Uganda, the conversation is extremely enthusiastic. Jones expresses, confidently, the impact he has seen Permaculture have consistently in Africa, despite the challenges of running education. A range of topics is covered in a short period of time, testament to the holistic interdisciplinary nature of Permaculture. It is evident the role of a Permaculture practitioner and educator is not limited to a singular science, whether it be social, or environmental and the boundaries between humanitarianism and environmentalism aren't clearly defined in Jones' motives to deliver, although, the overriding concerns of climate change is of leading significance

Box 34: Extract from authors field notes in interview with Jones

The turmoil of armed political conflict in southern Sudan and Uganda is well documented and has detrimental effects on food security. In general, it has reduced the individual's capacity to produce food, thus resulting in external support systems such as the World Food Programme intervention which is designed to mitigate the adverse impacts through food aid (Tusiime, Renard and Smets, 2013). Montclos and Kagwanja (2000) draw attention to the permanence of these refugee camps which last longer than basic transient settlements. They argue that their permanence is related to a multitude of factors, such as the refugees' relationship with the indigenous population and the access to local resources in surrounding ecological environments. The resettlement camps perceived durability has been described as

having ‘Urban features due to their concentration of infrastructures, socio-occupational profile and trading activities’ (Montclos and Kagwanja, 2000). Understandably, the conditions for the discussion of permanence is subjective, and only relative to political verdicts in the host country, which can effectively ‘facilitate or forbid refugee settlements. Intrinsically, the model of Permaculture adopts a ‘permanent agricultural’ approach in its outlook, yet the instability of political forums in this context may justify the inclusion of its aid. Montclos and Kagwanja (2000) reason;

> ‘*A complete withdrawal or a sudden contraction of humanitarian aid would not automatically mean the closure of camps: whether because self-sustainability would allow virtual cities to emerge as market towns, or because refugees would refuse to come back home and would become clandestine migrants’*.
>
> (Montclos and Kagwanja 2000)

The facilitation of Permaculture in this context can be seen as assisting the continuation of settlement, whilst reducing the essential demands for external food aid, by encouraging self-sufficiency via the farming of crops. Having said this, the ethical debate of permanence can be viewed from not only a political, cultural or moral perspective but also through a lens of environmental impact. The environmental impacts associated with displacement are determined by a number of factors, such as ‘whether refugees are self-settled or residing in organized settlements’, as both directly ‘affect settlement patterns and set the parameters of the refugees’ interaction with the host community' (Black 1994, p.1). Refugee situations are often misinterpreted as ‘temporary phenomenon’ Hunter (2009, p2), however, states long-lasting refugee settings are evidently becoming the norm which results in refugees living in perverse ‘states of limbo’. Addressing these settlement situations, Hunter (2009, p.2) states that though ‘their lives may not be at risk, their basic rights and essential economic, social and psychological needs remain unfulfilled after years in exile’. From a Permaculture standpoint, the ethics governing all aspects of behaviour aim to provide the frameworks for human settlement, whilst generating a ‘fair share’ cyclical economy. The generation of self-reliance conflicts with the intrinsic foundational relationship between the political violence forcing people into exile, and the aid regimes which support the ongoing sustenance on which the

camps depend so heavily (Branch2009). In the exploration of Humanitarianism in Northern Uganda, Branch (2009) identifies the overriding aspect as to why permanence of non-formal settlement is continuing:

> '*International humanitarianism and state violence developed a sustained relationship of mutual support during the civil war in northern Uganda. This collaboration was anchored in the archipelago of forced displacement camps, which at the peak of the war contained about a million people, and which were only able to exist because of, first, the violence of the Ugandan state in forcing people into them, preventing people from leaving, and repressing political organisation in the camps; and, second, the intervention of international humanitarian aid agencies, which fed, managed, and sustained the camps for over a decade. The consequence was that state violence and international humanitarianism each depended on the other for its own viability*".
>
> Branch (2009, p.1)

In Hardman's (2012) study of guerrilla gardening, he debates moral code related to researching environmental impacts, depicting from Keller (2010, p.10), 'one could argue that humans 'have indirect moral obligations to nonhuman beings' (Keller, 2010, p.10). Hardman (2012) quotes Benson (2000), stating that 'these nonhuman beings could include anything from vegetation to insects. The consideration of environmental ethics enables researchers to reflect on their impact on these beings. From an environmental perspective, such as that stated by Keller (2010, p.10), the moral driver as to why a Permaculture enterprise and its stakeholders would enter a foreign land of conflict to deliver human settlement education, may be justified. In a deeper argument for humanitarian intervention, Nardin (2002, p.1) draws upon the biblical order, "Thou shalt not stand idly by the blood of thy neighbour," arguing this has 'become a centrepiece for modern international relations. Particularly, Olwedo, Mworozi, Bachou, Orach (2008, p.1) share alarming evidence of the 'major cause of morbidity and mortality amongst children in displaced settings is protein energy malnutrition.' One could argue that the education of food production can greatly change the welfare and wellbeing of displaced individuals. Additionally, contemplating the theory

presented by Weisberger, (2013) on culture emanating from man's connection with the nature around them, the question could be posed as to what extent this displacement impacts upon the dissociation of people from their traditional culture.

The author is led to acknowledge that the complex dependency of beneficiaries within this complicated settlement arrangement may pose a barrier to the uptake and upscale of Permaculture practice, due to the contradictory nature of empowerment which is instilled in graduates of Permaculture education. In contrast to this, however, the valiant efforts of Jones and associates in permeating these camps for education purposes has yielded vital rewards. From an ecosystem services perspective, yields are identified through what 'can be obtained from ecosystems', however, specifically in respect of the north Ugandan refugee crisis, Jones identifies;

> *"The catastrophic ecological impact of displaced human settlement on surrounding forests, as millions take refuge and try to make a living from logging for charcoal'.*
>
> Interview with Jones (2019)

This fundamental catastrophe is responsible for large areas of ecosystem loss and is unaided by the inefficient household stoves of which are fuelled by the charcoal.

> *"Often the process of producing charcoal in these areas is unregulated and can be sold at the roadside to traffic heading to the city''*
>
> Interview with Jones (2019)

The benefit and complications surrounding PDC exposure in the refugee camps were explored in conversation with Jones. The semi-permanent nature of the camps posed ecological risk to the areas, due to the uncertainty of permanence which results in a non-sustainable culture of survival at environmental cost. The continued discussion, between the author and Jones, focussed upon the practical applications at the camp. He explained how Sector 39 designed heating systems and introduced rocket stoves, which burn up to 60% more efficiently whilst creating multiple yields such as charcoal for biochar, cooking and the heating of water. This simple idea, of redesigning rocket stoves for use in the global south, has a magnitude of

benefits. Correspondingly, in a field and lab study, MacCarty, Still, Ogle and Drouin (2008) tested three types of rocket stoves for performance comparison, with both the open fire and traditional stoves commonly used in Tamil Nadu, India. The stoves subject to testing were: 'a single pot stove, a double pot stove, and a double pot stove with chimney'. In particular, the measures addressed fuel use, carbon monoxide and particulate matter emissions. The results supported evidence towards Jones' rationale.

> '*The in-field use of Rocket stoves (without pot skirts) resulted in approximately 18% to 35% fuel savings as compared to the traditional stoves and reduced fuel used from 39% to 47% compared to the Three Stone Fire. Emissions savings for the non-chimney stoves were about 45% when compared with the traditional stoves and about 50-55% in comparison to the three stone fires. When emissions released into the room were compared for the chimney stove, a 40% improvement was seen over the traditional chimney stove, while an 84% improvement was seen in IAP as compared to the three-stone fire. '*
>
> (MacCarty, Still, Ogle & Drouin 2008, p.1)

The education of Permaculture, in the northern Ugandan region, supports residents to optimize their allocated 70m2 plots in which they grow food and interact socially through farming. There are considerable differences in the need for the adoption of Permaculture practices between the global north and South, as mentioned in the discussion between students of East Africa and the global north. Most notably, this was identified in relation to difference in need for food security.

Jones explains in his experiences of teaching around 500 students the ways of Permaculture. he has found that, due to the common understanding of food security in east Africa, the permaculture movement is expanding in this area and its implementation is becoming more encouraged.

Box 35: Extract from authors field notes in interview with Jones

From a global north perspective, Jones acknowledged the urgency of uptake doesn't meet the requirements of climate change amongst the general population, 'who can still visit the shops' when in need of food.

The topic of 'enterprise' was also discussed, as Jones made the point that as produce is grown there becomes trade, especially to travellers or visitors to the areas. Selling items, such as eggs, can vastly improve the livelihoods of persons implementing the lessons learnt from the PDCs. Jones makes this valid point, when chatting about education and enterprise;

> *''It has to be relevant, and we were teaching these courses in multiple languages. You can only make the point once, and then it gets translated in each language, so we had to be precise and make it directly relevant. When went back after the first PDC, everyone had been making keyhole gardens with whatever they could!''*
>
> Interview with Jones.

The keyhole garden mentioned is a tried and tested technique documented by Mollison (1988). This technique effectively utilises spaces for growing crops, by increasing the edge effect and surface area. This suits the small allocated plots in the refugee camps.

Summary of interview with Jones

Although the exploration into Jones' activities allowed a brief insight into Sector 39's recent Permaculture activities of In East Africa, the author's interests left an unanswered component to the study which would address 'the guiding moral compass of Permaculture educators and their sense of 'moral duty', in situations such as described.

In a similar narrative to Klein (2014), Jones expresses shared viewpoints towards the current economic system and the exploitation of crisis situations in east Africa, specifically the refugee camps. The cases study has highlighted that permaculture application and education, in semi-

permanent settlements, has been vastly welcomed for displaced people within the refugee camps.

From the author's perspective, the adaptation of PDC courses to suit circumstantially tough scenarios seems vital to the uptake of the principles in areas of human need. The lack of self-sufficiency has detrimental effects on environmental, social and political realms. In the case of disaster zones and mass human settlement, such as refugee camps, the research and manufacture of appropriate technologies seems paramount, in not only assisting human survival but also to the prevention of ecological collapse. This gives contexts for permacultures applicability in semi-permanent spaces as refugee camps are described to be temporary.

Uganda One Planet: A School Sustainability Curriculum for the 21st Century

An Interview with Charles Mugarura

The growing Permaculture movement in Uganda has given rise to the development of the East Africa Permaculture Convergence. This convergence was created in an effort to support a growing network of supported enterprises throughout Kenya & Uganda. Supported by Welsh start up, Sector 39, efforts have focused on human displacement settlements in refugee camps and offer education and 'disaster relief 'style solutions to agro ecology, as well as youth education in schools and the development of start-up enterprises.

More recently, Founder Charles Mugarura, youth spokesman for Uganda's SDGs, identified the need for youth education of the SDGs. He did this by developing effective educational materials and the 'One School One Planet' Permaculture program for schools. This program is in-line with the WFO, who identify young generations as being historically under supported and financed, with active policies and campaigns to rectify such inequality in rural societies.

Mugarura stresses, with enthusiasm, the importance of enterprise to create healthy cash flow for start-ups. From observation, this is a key barrier of project ideology and access to resources. Fortunately, the WFO and other partners within the SDGs' Major Groups, have specifically identified the strategies for the global south food chain. Charles identifies the need to incorporate economic and social drivers which shows his understanding of the integrated relationships between people, the economy and the environment. His reiteration of this point emphasises the need for more opportunities for emerging markets and a need for equity.

Box 36: Extract from authors field notes in interview with Mugarura

Among the aforementioned efforts to balance inequality, scholarships for PDC education are awarded, with a focus on women and children. The courses have had to adapt over the years,

to facilitate roughly 40 pregnant women, to ensure that they can attend, learn and feed their children. This initiative promotes societal choice, by using transparent and equitable processes and tools. Similarly, courses aimed at farmers and land stewards have been adapted into an 18 month long intermittent PDC, giving the farmers experiential knowledge, with the intention of each graduate going on to educate four more farmers and so on. The ability to self-replicate is a constant driver among East Africa's Permaculture initiatives, however, resource limitations such as financing and politics constrain their progress. Mugarura suggests the solution is:

> *"The simplest practical solution for the SDGs is Permaculture. Permaculture is a tool. "*
>
> Interview with Mugarura (2019).

In a similar process, Mugarura shares how demonstration farm methods and techniques allow for the most effective form of education and retention. In particular, centres focused on producing organic pesticides for supply have evidenced success.

In a similar manner, the WFO and IFOAM identify dramatic goals for the attainment of the SDGs, through agricultural contribution. Throughout the SDGs and their associated partners, rural women farmers are a target for support, as shown in the work of the WFO, and IFOAM (2019). The impact of supporting rural women farmers to build better livelihoods, ensure effective land management and biodiversity loss prevention, would magnify inputs due to the masses of women currently fulfilling primary production.

A common theme is surfacing throughout the discussions with Charles, such as the agenda of support for rural women farmers. Mugarura has identified the SDGs as a common language or vehicle of change, whilst implementing Permaculture in all aspects of operations.

Box 37: Extract from authors notes in interview with Mugarura

Uganda's Permaculture: Background, Purpose and Implementation

Collier and Derco (2014) suggest the continued commitment to smallholder agriculture, as the main route for growth in African agriculture and poverty reduction, is adverse with the proposed massive increase in production, including labour productivity**.** The latter requires a huge decrease in the proportion of the population that are engaged in agriculture and calls for a large move out of rural areas Collier and Derco (2014). Continuing the case, the evacuation of rural spaces is inevitable when resources, knowledge and climate change create uncertainty. A solution can be found in the management strategies of land stewards, as the influence of organic agriculture on 'poverty reduction' has been recognized to be effective by FAO (Diouf 2009), when implementing such principles and practices.

Limitations to smallholder success in developing countries are identified as being a lack of value chains, resources, skills, time (in relation to climate change), micro financing, and female support. This results in the reduction of rural producers. Interestingly, IFOAM (2019) confirms the limitations, to growth in organic produce throughout the global south, lie with the severe lack of primary producers, as consumer demands escalate each year, and with the lack of funding mechanisms required for training and resources. This point is solidified by the strength of the opposing mass monoculture TNCs, who have significant market share control over many global agricultural positions (Weis 2010). The dominance of the TNCs, throughout the global south agro-industry, makes small-scale organic agriculture difficult for start-ups who struggle to access micro-finance. The influx of sustainable farming microfinances, suggested in the WFO (2019) policy, would provide the opportunity for rural communities to access the training required to optimise land and spaces. The WFO (2019) has the aim of rectifying the historical lack of financial support and investment in research and development, extension services, affordable credit and infrastructure within the agricultural sector. They plan to meet this aim, by providing long-term financial commitment to a range of activities investing in; climatic extremes resilient rural infrastructure, along with appropriate technologies, inclusive of the resolutions to the, currently vacant, financing mechanisms required to transition into clean energy. Assisted by the Global Environment Facility and Green Climate Fund programmes, the intention is to develop accessible, cost effective financing initiatives in a gender responsive approach, specifically for women farmers. This recognition of agriculture and the responsibility of rural women farmers are acknowledged, with the promotion of social-economic empowerment of women into policy. This is in

partnership with rain-fed agriculture funding research programs, specifically targeting pro-poor farming.

Microfinance systems are suggested to have a huge influence on the primary producer uptake potential in East Africa (WFO 2019) and happen to be a major limitation to Permaculture application, despite efforts from sustainable activists. Microfinance refers to financing opportunities, commonly attributed to lower income clientele, generally, in poor communities. It has the aim of supporting economic development, through the growth of entrepreneurial activity, inclusive of financial services loans and small business loans (Awlaki & Saqran, Mona 2019). In essence, these loans are Microcredit loans, which aim to help alleviate poverty by empowering the poor to participate in markets, generate income and become more self-sufficient.

Through observation of Charles' account, the impact of education through PDCs in Uganda is assisting to regenerate lands and kick-start enterprise in primary production. This, inherently, elevates participants out of extreme poverty. In discussion with Mugarura, a key focus of implementing PDCs is to Maximise and maintain stakeholder engagement.

Box 38: Extract from authors field notes

Questions based on the principles of ES encouraged Charles to explain how the PDC and ongoing support utilises expertise, found in expert and local knowledge, to bridge differences through the formulation of solutions and decisions. This is a method of building a meaningful dialogue to capture the views and needs of the public, using deliberative and iterative engagement tools.

Box 39: Extract from Authors field notes

Education fosters a feeling of autonomy through competent, direct, reciprocal communication between NGOs and project participants of Permaculture education, to strengthen resilient agro- ecological systems. This is elaborated upon in the study from Kenya,

conducted by Hockin-Grant, Kenneth & Yasué, Maï (2017) who emphasise the impact which full PDCs have on participants in Kenya, in comparison with those who hadn't had the full training.

Establishing partnerships has proven to be a fundamental aspect to developing the East African Permaculture Convergence. This mimic the Major Groups of the SDGs for implementing the goals.

Box 40: Extract from authors field notes

Summary of Uganda One Planet

In line with the WFO agenda on assisting rural women farmers and stimulating enterprise, Mugarura gives an interesting account of permaculture frontiers in Uganda. Through education and social enterprise support, it is evidenced how Mugarura connects people to the SDGs with the use of permaculture. Mugarura recognises permaculture as the simplest practical solution when used as a *tool* for the SDGs is Permaculture. This could suggest, permaculture methods can be used as 'tools' independent from its ideology, to achieve shared actionable goals in line with other discourses.

Chapter 6

The emergent knowledge of a need for a common language between permaculture actors and other stake holders within society called for exploration into how permaculture communicates it system designs visually. Initially, design language is a presented from a discussion with Daniel Halsey, who is pioneering the art of permaculture visual representation, to bridge the gap between industries, cultures and other designers. Visual communication has the ability to transcend misinterpretation which can be experienced through language and culture. This led the author to explore the visual representations of design from a permaculture perspective.

Second, an observational account of this process being utilised in the U.K. is documented to evidence the permaculture design process, and the design presentation aspects, to have a better understanding of how permaculture designers can assimilate to other industry professionals.

Lastly, in response to the calls for a common language, as discussed in the literature and observational accounts of chapters four and five, the research was led to Caitlan Walker. Here it is discussed how the potential of an effective model of communication can optimise collaboration between cross-cultural discourses. A core communication model, 'Clean Language', that was also used in the interview process, and is industry known to facilitate group collaboration, is explored with reference to its applicability to help groups to achieve the SDGs and Permaculture goals.

Digital Design: A New Age

Daniel Halsey: Permaculture Research Institute, USA

'Daniel Halsey is a certified Permaculture and professional agro-ecosystems designer. Daniel has a Bachelor of Science degree in Temperate Climate Polyculture Design and a Master of Professional Studies in Horticulture from the University of Minnesota. He is hired nationally and internationally to design private homesteads, intentional communities, and broad-acre transition. He teaches in Haiti, Lebanon (Beirut), Costa Rica, Canada, across the United States, Scotland, England, Alaska, and Australia. Dan is also the managing director of Permaculture Research Institute USA'.

Box 41: (Halsey, 2019 retrieved from http://www.halsey1.com/Contact_Us.html)

Halsey suggests that the Permaculture design process, although progressive, is still liable to individualised aesthetic defaults. He feels it is critical to examine and re-evaluate how decisions are made, as the perceptive filters of our own culture can be in discord with one's distinctive naturalised concepts.

Halsey suggests that learned culture has created 'separation between the great beauty in the natural world and the world of our personal controlled living space, defining us as superior or civilized'. This causes conflicts in the Permaculture design process, as the vision is to strategically create 'functional aesthetic of natural systems,' by following the scale of permanence in a manner which remaps our 'personal aesthetic' tendency to a 'more natural expectation'. This process of decision-making uses the principle 'from patterns to details' to discover solutions.

> *"For sustainable ecological design, the principal task is abstaining from embossing our personal, cultural, and economic aesthetic on natures systems that already exist; yet simply design for the most effective use of area, resources, and fundamental resilience."*

Peters (2011) and Holmgren (2007) suggest, contrary to many primary production industries, the on-site assessment process of Permaculture looks for all available resources which may be enhanced or restored and is not inspired by extraction of the resources. This shift in attention aims to increase the robustness of the space and its ability to safeguard extreme events, while increasing the natural capital for future generations (Holmgren 2007).

Despite Holmgren (2007, p.2) specifically affirms that Permaculture is not limited to the 'landscape, skills of organic gardening, sustainable farming, energy efficient building or eco-village development'. Permaculture is, generally, 'used to design, establish, manage and improve these and all other efforts made by individuals, households and communities towards a sustainable future'. In light of this, the further development of the design process could yield beneficial results.

The process Halsey uses is cutting edge. In a conversation, he mentioned how his passion is fuelled by his experience with graphics and ecological design. This ignited the initial process of integrating graphic design programs, such as adobe illustrator, into the design process. In conversation, Halsey makes clear the driver behind such precise professionalism.

> *"As designers we only have a limited amount of time to get the message across, it needs to be an easy read, the key was to get faster"*
>
> *Interview with Halsey (2019)*

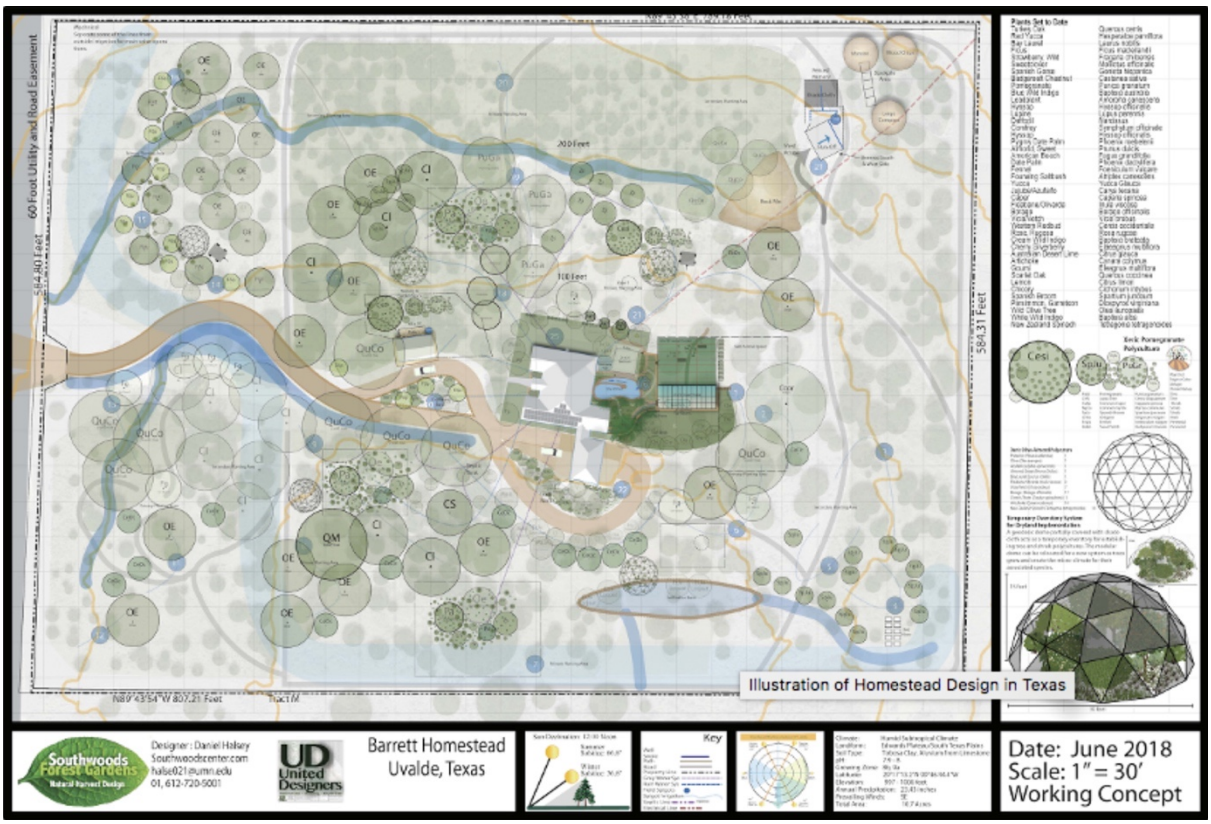

Figure 27: Ecological design produced using Computer aided design software

Image source courtesy of (www.halsey1.com).

Permaculture Design, today, is moving from pencil to digital, as once the system is learned, it speeds up the process. Halsey went on to explain, 'Until now the process has used pencil to paper for the artistic segment of the process, as pencil is organic. As the brain is very Zen, you see the whole thing at once as if you're in space". Whilst enquiring as to the reasoning behind such a radical upgrade in visual representation, Halsey explained:

> *"When we learnt the pencil process with landscape design, we would end up redrawing each time, which is a huge waste of time, especially when working with clients who often need to change things in the design"*
>
> *Interview with Halsey*

In further discussion, insight was made into the evolution of Halsey's method of mapping designs in the most time efficient way. Truly and accurately representing the daily design

activities is a necessary component of the new age sustainable designer, and graphics designers are of no exception, Jedlicka (2010). This makes reference to the requirement for a 'new generation' of designers who actively move beyond the traditional principles of design. Reflecting on his early days in digital conceptual design, Halsey discussed how he came to his realisation of the need to update the approach.

> "*We wrote down the process of everything needed, then mapped out an outline into a linear process. The design process is mirrored in the layers of illustrator and folders of the computer, using data mining in the folders* "
>
> Interview with Halsey.

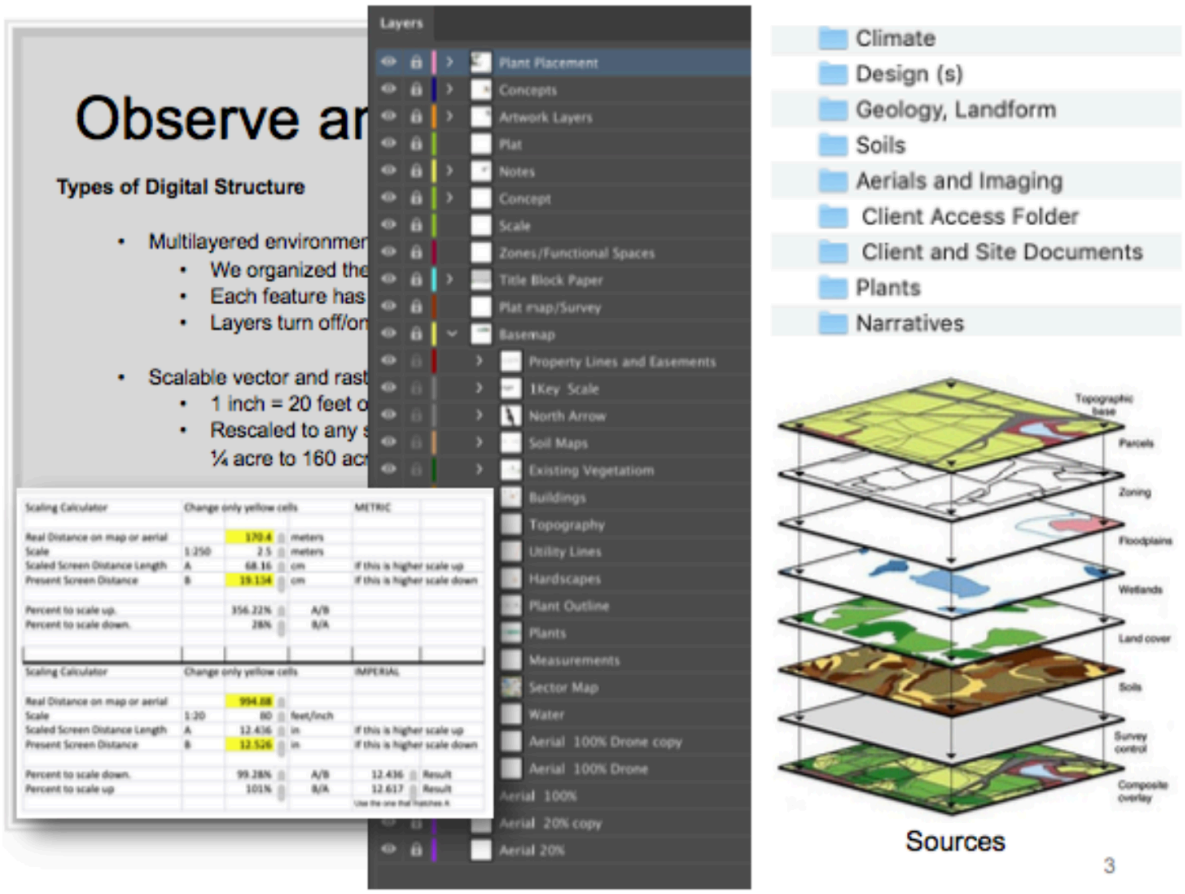

Figure 28: Digital design course content from Halsey 2019, displaying the layering process and file storage system of digital design

In an interview with the researcher in 2019, Halsey made a crucial point for Permaculture designers;

> *"The industries have a language which everyone understands, and this is a global language, which was missing in Permaculture.*
>
> Interview with Halsey (2019)

Daniel went on to explain the difference between working alone as a designer and working in collaborative teams. Often the workload on larger projects requires a collaborative effort, especially when working on international design. There often develops a need to establish teams who are local to the area and this requires a method for fast communication. Halsey states that designers choose very different visuals to communicate their design various visual representations designers choose to employ when illustrating the design concepts, that;

> "*This is fine when you're working on your own as a designer, but if you're working with NGOS, you have to meet them more than halfway. Bringing Permaculture design into a format which other industries and governments recognise, means designing it using their language with our composition".*
>
> Interview with Halsey (2019)

As this research looks at the potential for Permaculture as a solution for sustainable development in the global north and the global south, it was identified how the international potential to create a global language was now apparent in a visually scientific art form. Until present, Halsey draws a crucial hypothesis that each designer has been using a different individualised language to visually describe their message in their designs. This means that peers cannot clearly understand each other's designs, thereby making collaboration difficult and time inefficient.

How It Works.

(A Condensed account of the process from the Researchers interview with Halsey 2019)

The process of digital design follows a similar process to illustrative design on paper. The process begins the same, however, to execute in a digital format, the process Halsey uses is shown below. An example of the map layers and symbols being used in a case study can be found in chapter 6.

A Condensed account of the process from the Researchers interview with Halsey 2019)

The digital design processes:

1. *'The processing requires acquiring the info from the data mine to create the Basemap graphic'. This includes images from drones and satellites, which are processed to map property scale.*
2. *The design is then developed through symbols. The symbols correlate to a plant species database of ecological functions, making species selections for poly cultures easier for the designer and systemised. The plant database is continuously updated, adding new species regularly.*
3. *The visual artwork for the design is developed with symbols using circles shapes to scale, which contain the first two letters of the scientific names of species, this ensure international usability, bringing it as close as possible to a standard process*

List from an Interview with Halsey 2019

Barriers to Digital Design.

A range of barriers to 'going digital with Permaculture design', were discussed in an interview with Halsey (2019). The barriers vary depending on personal circumstances and geographical locations and were identified as the following;

- Finding a quiet space
- Bandwidth
- Storage capabilities
- Access to Software and Capable computers
- Cost of software
- Different countries charging more for software

- Environment capabilities
- Often in some countries there is no written language
- Some cultures use different maps and do not use aerial maps
- Some cultures use elevations, displayed laterally

Source: *Researcher's Interview with Halsey* 2019

Furthermore, Halsey suggests there are concerns within the digital design process itself. These are stated below:

- **Overwhelming levels of detail:** At times, given the amount of data needed to communicate any one design in its entirety, can be overwhelming without an organised and strategic method of input.
- **Lack of data resource** (inaccessible, LiDar): Often data is insufficient to develop master plans.
- **Computer system capabilities and add-ons:** Digital design requires minimum standards of software and processing speeds to be cost effective.
- **Storage and portability:** Large data files require large storage capacity
- **Learning curve, expertise through repetition:** There is a noted transition phase of the practitioner learning the processes of digital software programs.
- **Staying organized:** large data sets and team collaboration requires high levels of organisation.
- **Adding colour is dangerous:** Perception of style is subjective and informed by different cultural make-ups. When creating a common visual language, simplicity and functional use of colour is key, not aesthetics
- **All graphic design rules apply:** Colour, simplicity, visual noise and when to stop.

Source: *Researchers interview with Halsey 2019*

Furthermore, the digital design process requires partnerships of people who are familiar with the area, this poses the dilemma of exclusivity. Daniel mentioned a case study he had facilitated in Haiti, where, there although there was little digital knowledge due to resources, the participants knew all the names of the plants and all their uses. This highlights that different practitioners have different skill sets and different areas of focus. Although many

practitioners are not the creators of the final artwork, multiple practitioner roles serve one another, collaborating cross-cultures toward the successful execution of the final product or final concept design.

Standardised Scale for Digital Permaculture Design

Each digital project has different scales, however, using the metric system allows a common language on screen and can facilitate detailed projects of up to 160 acres at the scale 1:250. Halsey reports having worked on projects of over 50'000 acres. A key focus when working in this detail was identified as;

> *"The least amount of artwork for the most amount of communication, limiting what we put on the screen means much less distraction as there is a noise factor. How few colours and how little symbols can we make this? "*
>
> Interview with Halsey (2019)

Creating base maps can be achieved rapidly, by the use of drone imagery and Google Earth images. Drones take real time imaging and can be compared with aerial maps, to allow the development of DEM files to make topography. Although convenient and effective, in many areas, such as in the United States, the use of drones is restricted. This then relies upon a series of screen grabs from Google earth, in the highest resolution possible, which are then stitched together in Photoshop. This can, potentially, affect the accuracy of readings.

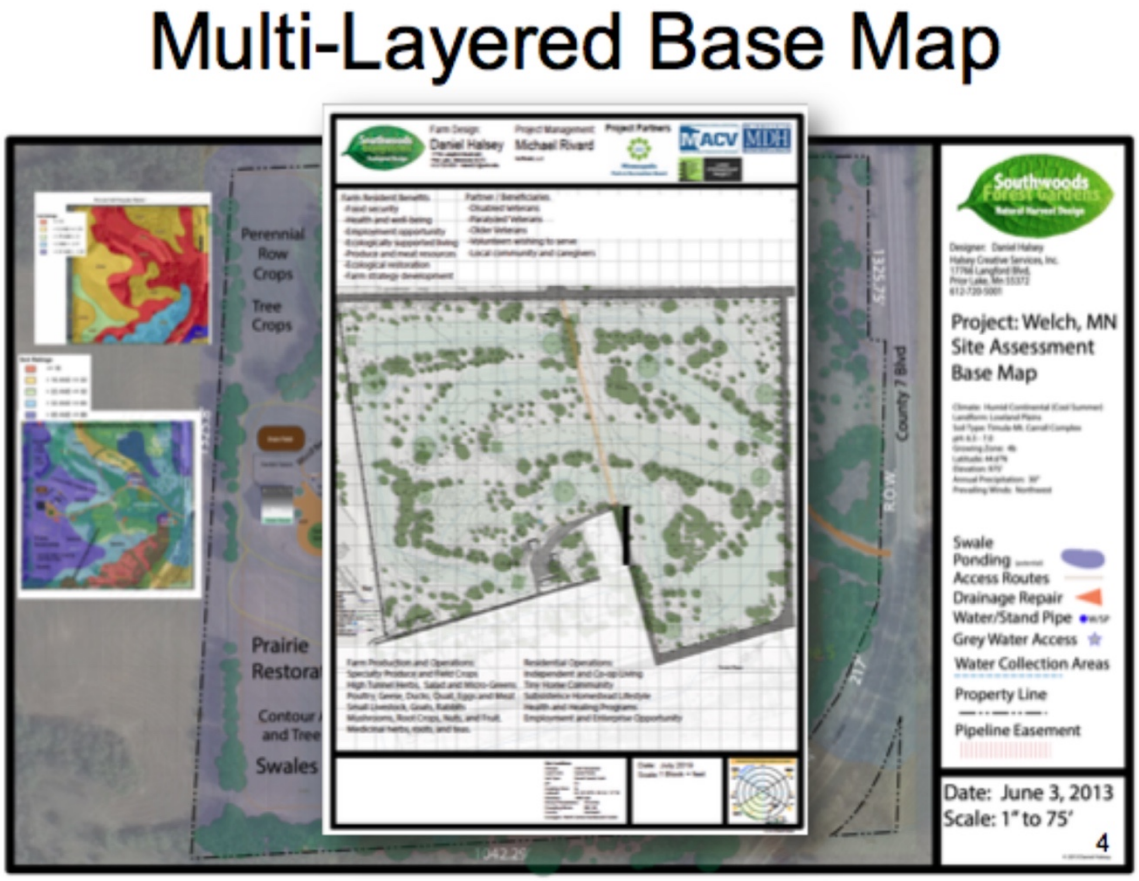

Figure 29: Multi-layered basemap created on Adobe Illustrator, source United Designers digital design course with Halsey 2019

Supporting Collaboration: Symbols Library

The development of the symbol's library, used by Halsey's lead organization 'United Designers,' has created symbols for each individual species and poly culture. These are stored as an 'asset' in the library, at 1:250 scale. This means that they are ready to 'drag and drop' into the design artwork, to be used by everyone using the library. The symbols library stores binomial scientific names as search terms, however, when presented on the artwork, the first two letters are displayed as a symbol.

Supporting Collaboration: Plant Database for Digital Permaculture Design

I am intrigued to learn how professional design is systemised, when each site is variable. As a result, the conversation develops into the specific techniques Halsey and his team are using in the digital domain. Most recently the development of the open source 'Plant Database' and respective symbols library, for use in graphic design software packages.

Box 42: Extract from authors field notes

Halsey describes the 'plant database,' used by 'United Designers', as an intrinsic part of the speed and accuracy process. It is an ever-developing data bank of plants and their ecological functions, identified by biome specificity. The collective input of designers builds this data bank and, as such, it is ever growing with richness. Halsey suggests the key is to have a 'gatekeeper', whose role is to validate inputs, based on; ecological functions, scale of plant symbol dimensions and attributes for developing digital master plan maps. The plant database now holds upward of 2300 plants.

Using the scale 1:250 allows the designer to select plants in the database which have a respective symbol in the library to use directly in the master plan artwork. The symbol is displayed as a circle and preprogramed to scale as its mature canopy size. This assists designers in deciding on placement for polycultures.

	A	B	C	D	E	F	G	H	I	J	K	L
1	ID	Name	Scientific name	Plant Type	Height	Spread	Root Depth	Seasonal Interest	Seasonal Interest Specifics	Flower Color	Root Type	Bloom Time
2	2458	Arugula	Eruca vesicaria	Annual	12	12		Summer	A very easily grown and fast-maturing			May, June,
3	2060	Beet	Beta vulgaris craca	Annual	12	6		Summer	The beetroot is widely cultivated, espe			June, July,
4	2590	Chinese (Napa) Cabbage	Brassica campestris pekir	Annual	12	12	12	Spring	Bright, light green, curly and ruffled le			April, May
5	2081	Chives	Allium schoenoprasum	Perennial	18	15	6	Summer	Pink and purple flower; round flower c			May, June
6	1925	Junegrass	Koeleria macrantha	Grass	24	18	20	Spring				May, June
7	2288	Wild Leek (Ramps)	Allium tricoccum	Perennial	12	8	0	Summer	In leaf March-J	White	Bulb	June, July,
8	2588	Dano Lettuce	Lactuca 'Dano'	Annual	12	12	5	Spring	Deep and solidly red; head is compac			May
9	2589	Integrata Red Lettuce	Lactuca 'Integrata Red'	Annual	12	12	5	Spring	For cold weather production of elongat			May
10	1754	Wild Lupine	Lupinus perennis	Perennial	24	24	8	Spring	Difficult to establish.			May, June
11	2591	Pac-Choi	Brassica rapa chinensis	Annual	12	12	12	Spring	Thick, glossy leaves and flattened pal			April, May
12	2206	Radish	Raphanus sativus	Annual	10	6	3	Summer-Fall	Many varieties including globe, oval, c			
13	2592	Tatsoi	Brassica rapa rosularis	Annual	12	12	12	Spring	Unique and easy to grow. Suitable fo			April, May
14	2442	Turnip	Brassica rapa	Annual	6	6	4	Spring-Summe	Can be harvest			June, July,
15	2092	Sweet Vetch	Hedysarum boreale	Perennial	24	8	18	Spring-Summe	Red flower; green foliage			May, June
16	2593	Vitamin Green	Brassica rapa narinosa	Annual	12	12	12	Spring	Smooth and brilliantly deep green lea			April, May

Figure 30: National Plant database segment, courtesy of Halsey, United Designers 2019.

Polycultures In Digital Permaculture Design

Leibman (2018) explains the positive effects of using poly cultures, which are often a core component of Permaculture design. They are often, alternatively termed 'plant guilds' (Molison 1988) where multiple species are selected and planted together or in close proximity. They often form beneficial ecological symbiotic relationships.

> *"Polyculture cropping systems are important parts of the agricultural landscape in many areas of the world. Although farmers often use polycultures without applying fertilizers or pesticides, polyculture yield advantages are not restricted to low-input conditions."*
>
> *Liebman (1987, p1)*

Halsey goes on to explain how polycultures are utilised in the digital design process.

> 'In the key is a symbol for polycultures, also shown in the symbol's library, which brings plants together. By collecting them together, an ecological functions list is created, which then work as a unit and the symbol can be dragged in. This creates an individual piece of artwork to scale for each species symbol with the greater polyculture. The common name is then added later for the client and displayed in the key.'
>
> Interview with Halsey (2019)

The International Potential of Digital Design

In light of SDG frameworks, the ability to partner coalitions on projects is paramount for the 2030 Agenda to establish the seventeen SDGs.

Beisheim and Simon (2018) identify the need, "calling for multi stakeholder partnerships (MSPs) *that mobilize and share knowledge, expertise, technology and financial resources to support the achievement of the SDGs in all countries, in particular developing countries" (SDG 17.16). In context, Halsey suggests;*

> *"The advancement in solidifying a common graphical language and systems approach in Permaculture provides a piece of the puzzle which up till now, has been missing,"*
>
> *Interview with Halsey (2019)*

Suitably, Beisheim, and Simon (2018) draw attention to the MSPs (SDG 17.17), dissecting the following relevant UN statement in this context for collaboration; "encourage and promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships" (source, https://sustainabledevelopment.un.org/sdinaction) of which an international graphical language would facilitate progress.

Providing the resources are available, the system will provide opportunities to any designer who has learned the digital process. This can be viewed as a digital model of social Permaculture as many designers of different skill sets can work on a project concurrently, from any location.

Digital Social Permaculture

Extending from the need for digital collaboration, 'United Designers' was incepted from the need to get more people involved, including partnerships which allow work to get done faster, and also teaches the process to a wider network.

Looking Forward

The future of technological design is quickly advancing into virtual reality and 3d modelling, which is being pioneered with the use of drone imager, AI, and professional production software. Exploring the next stages of design Halsey suggests;

'The next stage is providing the capability of being able to walk through a design. 3d modelling now makes 3d artwork of trees, which look real.'

Interview with Halsey (2019*)*

Although there are benefits to this progression into professional Permaculture design, the drawbacks of VR design according to Halsey are;

- **Massive file sizes**
- **Issue of ability to change the design due to file size**
- **Visually representing the differentiation of species phenotypes**
- **People struggle to visualize**: So 3d rendering is of design maturity is not displaying the period following a design installation when plants are young and less aesthetically satisfying.
- **Easier to give a 2d drawing**

Source: Extract from author notes from interview with Halsey 2019.

Summary of Digital Design

Halsey echo's a recurring theme of the overall research: The needs for a common language which 'gets the message across' in and easy to read format. Specifically, within digital ecological design, a systemised approach has the potential to create industry standardised imagery. The language of imagery and mapping aided by minimalism assists cross cultural language barriers by providing a visual representation for all stakeholders to visualise from this would serve to bridge communication between outside agencies and Permaculture to allow for service assimilation.

Practical Permaculture Design Frontiers: UK Case Study

Introduction

In the UK, the use of Permaculture ethics and principles has taken many forms. One of these forms has taken shape in the emerging market of advanced consultancy for homeowners, who wish to implement a more eco-friendly and desirable living space. Re-designing established human settlements for sustainable optimization is becoming a desirable experience (Kennedy 1991). This is due to citizens becoming more aware of the health concerns attributed to non-organic produce (Morgan 2015). In the Global North, the Permaculture design process is recommended to optimize urban spaces (Kennedy 1991). In this case study, the process of Permaculture design frontiers is explored, through observations within an ecological design consultancy service, 'Earth Repairs', located in Oswestry UK, and founded by Oliver Boon. The author observed the client's journey, from their initial contact with the firm through to the digital design process.

The author's position, as an active 'practitioner' and collaborating with the firm being observed, could be seen to compromise his role as 'researcher', particularly when there is invested interest and involvement in the outcome. As Chai (2002) explains;

> *"The researcher seeks primarily, to understand and explain an observed organizational phenomenon by developing a theory around it, the practitioner is often more concerned with the consequences and instrumental effects of a particular set of management insights, policies and actions. Justification for the practitioner does not come by the way of empirical verification or conceptual rigour, but by way of desired outcomes- the ends often justify the means. Whereas the researcher is governed by a code of practice established by a community of scholars because of its inevitably truth-seeking orientation, the practitioner is*

essentially a pragmatist- what works is more important that what is true."

Chai (2002, p.4)

Inevitably, the challenges of assuming both roles of practitioner and researcher, was fraught with 'embedded differences in priorities' (Chai, 2002, p.4), however, the process aimed to legitimise a fully documented account of effective Permaculture services, in the global north.

The previous interviews with Halsey, explored the applicability of the 'digital design process.' This case-study allowed the author to observe the digital method in its application. By immersing in the design process, the researcher was able to experience and challenge the data recorded during a previous case-study interview. This allowed the author the capacity to make comments upon the process's justification for applicability in the field. It is to be noted that there were a number of site visits to gather data and carry out analyses for the design process, however, the researcher's collaboration was required in numerous developmental meetings and design gatherings, in addition.

Site Analysis

The site was visited during the transition into the summer season. This was useful as it provided insight into canopy densities, which illuminated the team to the areas of shading and which species and guilds flourished in the local climate. It was apparent from the client interviews, in which 'key functions' were discussed at length, that interventions were needed, to help optimise the space and restore biological balance. Some of the key components discussed included; grey water system management, forest garden optimisation (of the pre-existing mature orchard), kitchen garden planning and water catchment.

Initially, the site visit included walking about the site to observe any current biological or environmental issues evident in the space. Particular attention was paid to the energy inputs and outputs of the space, such as wind directions, sun angles, slope angles and areas for concern. Walking the site pathways gave the team a feel for the natural flow of the space, and how energy efficient the site was at the time. Boon used the drone to take perspective

photography of the site, which takes around ten minutes, and measurements were taken of the main house length, which will become the basis for creating the map scale later on.

Box 43:Extract from authors field notes

Edible spaces were discussed in detail, referring to the low maintenance techniques of Crawford (2010) which would effectively reduce the requirements for intervention and maintenance once planting had taken place. The site had beautiful, yet unmanaged, apple and cherry trees, situated in a somewhat shaded area towards the end of the garden on the lowest elevated terrace.

Separated over three terraces, usability of the space was restricted by the steep incline and sloped pathways. For this reason, the use of the drone was helpful for initial site readings, imaging and mapping. The drone used a pre-programmed flight path, to take a series of high definition grid photos. Mapping space with drone imagery is emerging to be extremely effective (Zhang et al 2016), as verified in interviews with Daniel Halsey who explained its efficacy in capturing real time, high definition images of land. The tool is identified as being the most time effective, accurate method for data acquisition, in this consultation service. Legal policy in the UK allows for the use of this tool, for now, however, Bassi (2019) suggests;

> *'European Sky Strategy Regulation, Article 140, may change this, as a result of 'concerns related to the collection and use of drone data, privacy safeguards, telecommunications and cyber- security breaches, registration and identification of both UAVs, and their pilots and operators, and also liability'*.
>
> Bassi (2019, p1)

This is an evidenced case of how technology can be highly effective for sustainable development when used responsibly. In earlier interviews, D. Halsey suggested how this was highly restricted in the U.S.A, due to legal policy and enforced laws.

From the flight of the drone to the computer: the initial drone spatial topography mapping was created from the mosaic image of canopy species and structures. The level of detail in resolution outperforms google earth imagery and is recording exactly what is present at the

point of contact with the client. For example, fallen dead trees which would not be shown on the Google Earth imagery.

Box 44:Extract from authors field notes

Using the Permaculture design sequence (Mollison 1988), map layers are accumulated and guide the process of interconnecting the existing systems. By moving from paper sketching to the use of technological tools, the designer discussed 'how considerable time is saved to create accurate, scalable, replicable maps for creative ecological development'.

Graphic design software is used to create a visual spatial canvas for further gathering of data, and logging components of the system. Following an adapted process outlined by D.Halsey, site analysis gives accurate recordings of the space such as species, key features and topography.

The Base Map

Once the images were uploaded into the graphics processing software, the existing features, structures, plants and boundaries were outlined.

Box 45:Extract from authors field notes

This created the Base map upon which all other site visits and team collaborations were based on. Shown in *figure 31*, the base map has been printed in colour on A3 paper and is used for the second phase of site analysis. The next visit allowed the team to re-walk the site and visualise how key features, required by the client, could take form. Different scenarios and options were pencilled in, sketched and discussed at length.

Each team member has their own copy of a base map and is given ecological- artistic freedom to create visualisations of the potential design, looking at species placements, key feature placement, forest garden guilds, flows, waste management, and entertainment areas.

Box 46:Extract from authors field notes

The coloured map allowed the team to see existing canopy cover, providing crucial information for ongoing decision-making such as tree management and interventions.

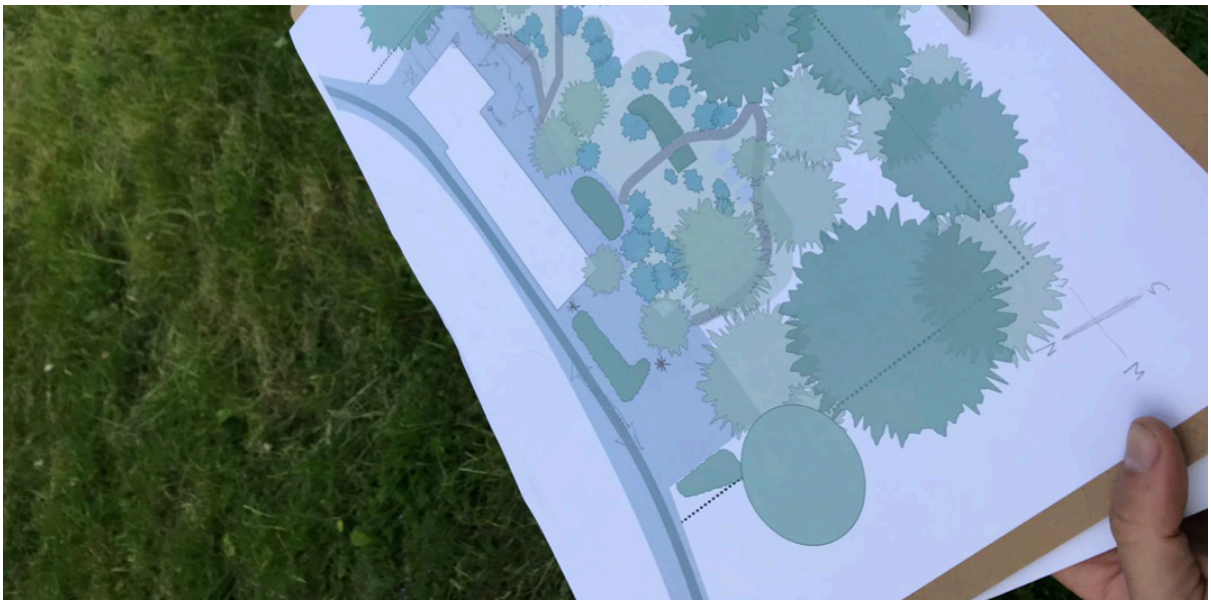

Figure 31: Researchers image of Base-map site assessment on a homestead property design UK. Base-map constructed from drone photography, processed by digital graphics package.

The data recorded from the site visit was collected and further team meetings were held, to collaborate and share ideas as to 'what should be placed where', through mind mapping. The collective pooling of ideas allowed for a diverse range of concepts to emerge, before implementing the zone sector map shown in *figure 32.*

*Z*one Sector Map

The zone sector map uses general bubble visualisation, as a rough guide to design 'from patterns to details' (Mollison 1988). The process of dissecting macro to micro is crucial for team collaboration, due to the diverse skill sets of the team. Some individual members of the

team hold a range of skill sets, suited to certain ecological domains, which suit zone mapping as designers can be assigned complementary micro projects within the design process.

Liaising with the client on the suggested placement of zones, and initial concepts, is paramount before progressing any further with ideas and suggestions. At this stage, the client was given the opportunity to review the teams' ideas on placement and arrangement and was advised on any additional elements that the team felt they could necessitate. The emergent feedback from the client could then be integrated into the team meetings and be considered, to ensure efficiency of placement within the conceptual design phase.

Observations in phase one had noted problematic trees which were either dead, causing structural disturbance or overgrown. Interventions were organised with a local tree surgeon, to start the process of preparing the site for any further work. In this case, one tree had grown into the roof of the small outbuilding and was causing structural deformity of the building which needed addressing immediately. Another cause for concern was the considerable amount of shade upon the garden from the imposing mature boundary trees. This would pose a barrier to the successful implementation of a future forest garden and grey water wetland management system. It was decided that the culprit trees were to be managed in the most suited manner, to open up the canopy and prevent further structural damage.

Once the thinning of the climax canopy was complete, a better idea of shaded areas was observed; influencing forest garden species placement on the concept design.

Box 47: Researchers image of Base-map site assessment on a homestead property design UK. Base-map constructed from drone photography, processed by digital graphics package.

Whilst this project employed multiple specialists, the 'project management' component tracked jobs and processes on online software, such as 'Trello' for job cards and 'Slack' for team discussions.

In the client discussions, the brief presented for the design were given

The Key Functions of the Site are to:

- Promote a diversity of wildlife
- Create a sanctuary for us
- Low maintenance as is reasonable, especially in a few year's time
- Edible produce, although we do want to get more from the garden this is not the top priority

Client Must Haves

- There is very little that we want as an absolute must in the actual planting, but, taking the above principles into account, lots of attractor species
- We need an electric supply to the annexe at the bottom. I may be putting a small kiln in there and don't think a solar panel/battery system will provide sufficient power.
- Solution to the septic tank- soakaway problems is an absolute priority!

Box 48: Extract from authors notes from initial project scoping meeting

Client Wish list:

Herbs: Oreganos, mint, rosemary, lavenders, trilliums, garlic. wild garlic, fennel, borage, thymes, sages, lemon balm,nasturtiums, bergamot, catmint, horseradish, feverfew, coriander, parsley, basil.

Fruit: raspberries, blueberries, jostaberries, worcesterberries, redcurrants, gooseberries, Nepalese raspberries, Quince, Medlar, Autumn olive, Figs.

Vegs: Perennials like chards, kale, spinach, Egyptian onion, Turkish rocket, sorrel, and cardoons, Jerusalem artichoke. Also, some annual veg, beans, purple potatoes, sweet potatoes, celeriac, squash, peppers, chillies, tomatoes, salad leaves., mushroom logs, comfrey for fertilizer

Other: sea buckthorn**,** foxgloves, lupins, ferns, honesty, dogwoods, alchemelia mollis (lots), philadelphus, berries like pyrocanthus and cotoneaster for the birds, holly, honeysuckles, hawthorn, walnut.

Box 49: Extract from authors field notes, after initial project scoping meeting.

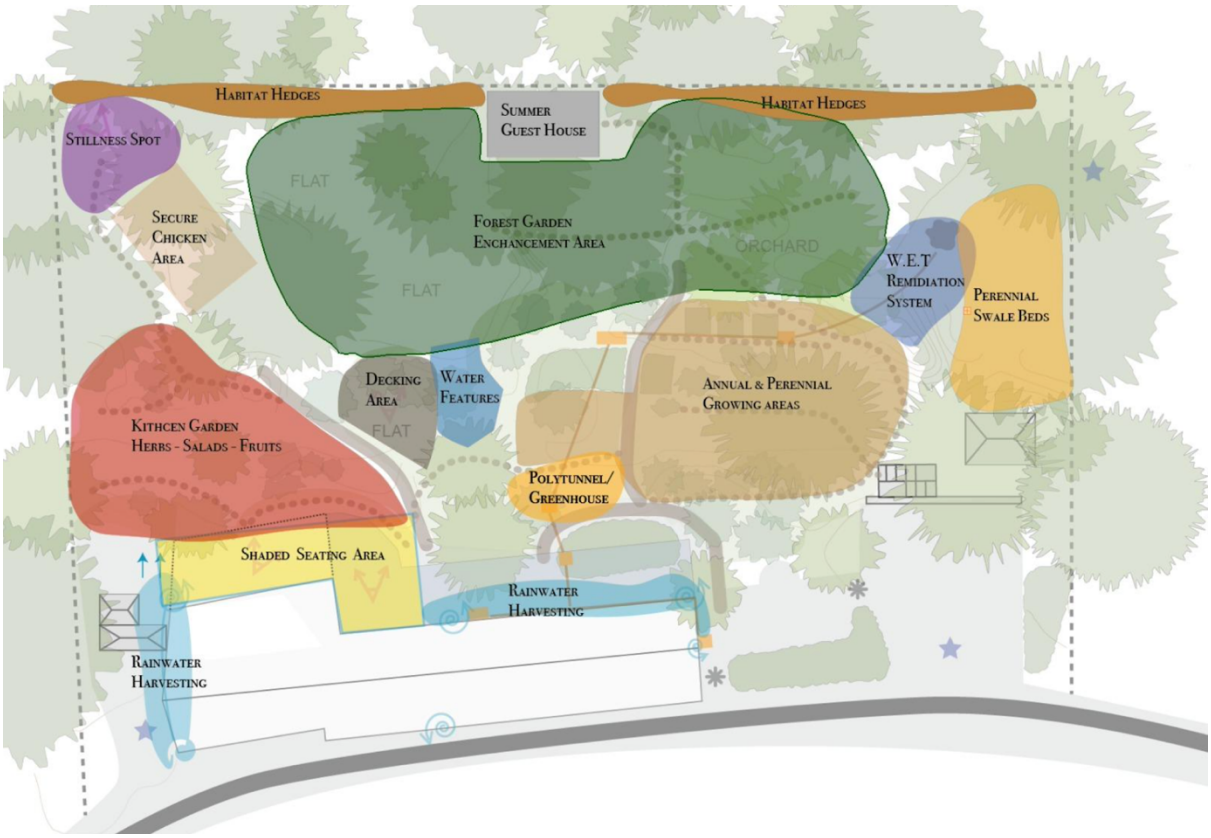

Figure 32: Courtesy of Earth Repairs (2019), researchers collaboration Zone Sector overlay map.

Concept Design

The initial stages of zone planning, and client interviews provided the foundations for the ecological design. From this, the team could build understanding around how systems could interact and how the systems can best interact and integrate for ecological efficiency, through species placement and by connecting biological functions to optimise the space. Displayed, In figure 30, is the working draft concept design that the team proposed, to provide the ecological functions in line with the wishes and requirements of the client. At this stage of the process, rough placements and ideas were modelled out for further review.

The concept map has been printed in A1 and laminated. This is presented to the client at their household and, collectively, adjustments are made. Open dialog is free flowing between the lead designer, Boon, and the property owners. Whiteboard markers are used to quickly jot down ideas on the laminated printed design to see what ideas best fit. This allows free flow of ideas between the designer and client.

Box 50: Extract from authors field notes

Using adobe illustrator allowed the team to add, remove and change the concept design in a timely manner without having to constantly redraw the whole map. The colour saturation was kept to a minimum, so detail of the components to be added could be easily identified. On the map in *figure 33* , existing trees have a rough edge and trees to be added are shown as circles, however, it was acknowledged, through 'Halsey's digital design' instruction, that rough edged shaping can use a considerable amount of storage space on hardware or cloud storage, resulting in a strain on processing times and storage potential.

Figure 33: Researchers image of conceptual site design on a homestead property design UK. Base-map constructed from drone photography, processed by digital graphics package.

Again, further client feedback on the process, at this point, guides the team on the final design

Box 51: Extract from authors field notes

The client's amendments are shown below. These points are the building blocks of the final concept design.

Client's amendments and feedback.

- No shaded seating area near house
- Herb beds fronted with wood or sleepers
- No pergola at top of steps, it would potentially block the view.
- No willow arch at bottom of steps
- Handrail downside of steps
- Does it need to be decking? Can it be slabs to match the other patio? I am concerned also that decking can get very slippery and there is quite a drop off the edge!
- Chicken area moved to orchard area
- Stillness garden extended to whole of the old pond area, planted with ferns and white/quiet flowers and a central area open with chippings, thymes etc.
- A trill in here if possible and some large (1metere high approx. stones)
- Willow arc incorporating the current willows to embrace this area
- Not extend the forest garden into all the current open grass. Keep some of his open, possibly planted with meadow wildflowers and annual mown paths through the grass

- Forest garden to extend only to line from bottom edge of the septic tank/sumac bank.
- Instead possibly extend the forest garden up the garden incorporating the area of current slopped small lawn where we were thinking of more keyhole planting but not shading the polytunnel. If not possible then this lawn to be keyhole beds.
- Poly tunnel on flat lawn
- Raised beds to be quite high so I don't have to bend much
- Compost heaps?

Box 52: Extract from authors fields notes

Source: client email (2019)

Final Permaculture Design:

Progressing into the final design stage, the use of the 'National plant database' was adopted for accurate species polycultures, whilst the wishes of the client were incorporated into the final design artwork. At this stage, the artwork is not presented with a 'key, scale, sun scope, wind directions, plant list or branding, but is ecologically developed to cover all aspects of the client and site requirements (to scale), before being signed off by the team and client for finalisation. It is paramount, at this stage, that the map is 'industry transferable,' as the next phase will instigate contracts with independent contractors and their ability to execute the plan depends on its 'readability and accuracy'. Halsey, in previous interviews, stresses the importance of this 'transferability between industries' and, from observations, the team acknowledged why this was so important.

In the early stages of tree surgery, confusion amounted among contractors as to the extent of their work, resulting in losing half a day of work. This highlighted inefficiency, despite the contractors having had a site tour and discussion about proceedings. The process of map creation, job lists and mind mapping, along with implementing an on-site Project Manager, would have potentially avoided this situation. This, however, would have increased service

charges and further extended design preparation. As more contractors are included, the management of their specific jobs on site needed micro-managing.

Box 53: Extract from authors field notes

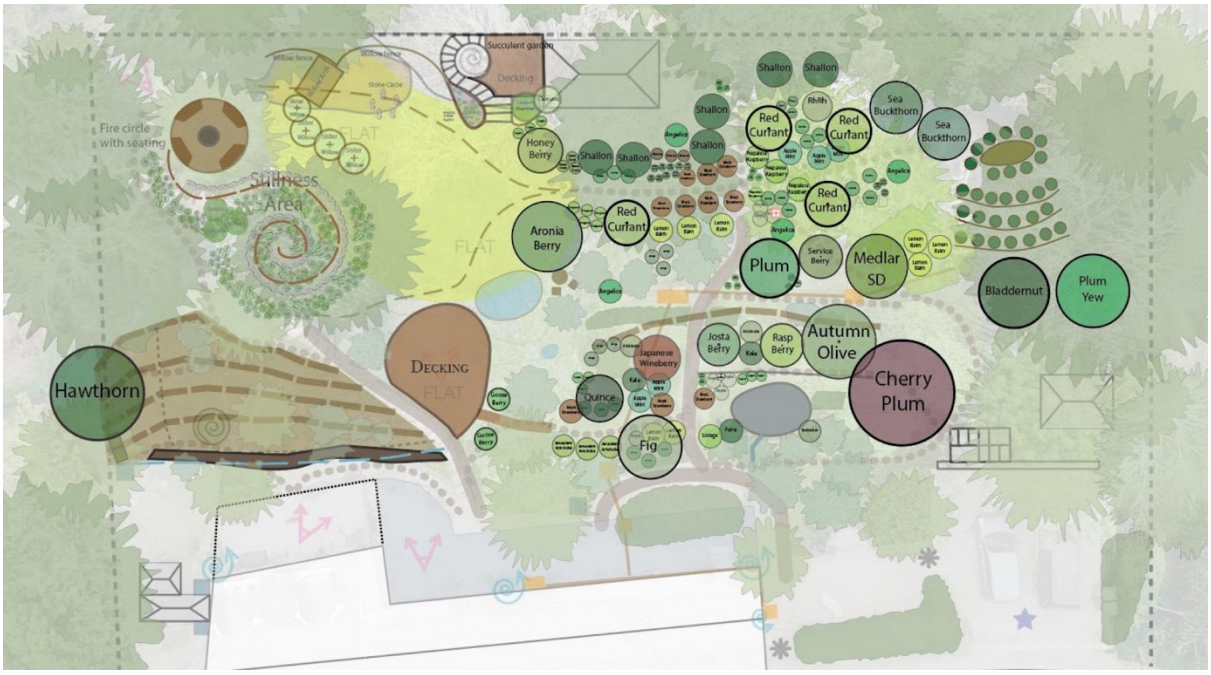

Figure 34: Researchers design collaboration with Earth Repairs North Wales, showing functional edible, ecological design of a homestead, using digital graphics.

Courtesy of Earth Repairs U.K. *figure 34*, displays the final working concept design for a homestead in North Wales, using Daniel Halsey's National Plant Database and Symbols library. The design was constructed by Oliver Boon. The displayed map, in figure 34 is to the scale 1:250. This map shows the final artwork, before adding the map key, scale, and key feature labels.

Throughout the consultation process of ecological design, Mollison's (1988) Permaculture design process was used, following the procedures of;

- Mainframe design base map
- Site analysis: zone planning sector analysis with applicable key functions.
- Workflows and connecting components

This results in a concept design (*figure 33 and 34)*, followed by a detailed ecological design *(figure 35),* which encompasses the social, physical and spiritual requirements of the

homestead owners. To reiterate, the client wished for a design sculpted with the following key functions as priority:

- To promote diversity of wildlife
- To create a sanctuary for us
- To ensure low maintenance, especially in a few years' time
- To provide edible produce

The design followed the Permaculture process and was professionally delivered, following a digital design procedure. To '*Promote a diversity of wildlife',* the team followed the pioneering direction of Crawford (2010). The forest garden approach *promotes biodiversity*, reduces inputs and workload to meet the requirement for *'low maintenance' and provides 'edible produce'*. Shown in *figure 32*, the concept design displays plant species to be added to the property. These are shown as circles and are mapped alongside zones and key features.

Once the fundamental components were in position, contributing designers added their artistic flare, making the design pop! A specialist in willow weaving was contracted to produce an impressive installation at the boundary of the property. This created a wildlife corridor. Although the design addresses functionality first, the aesthetic talent sets aside the design from simply landscaping.

Box 54: Extract from authors field notes.

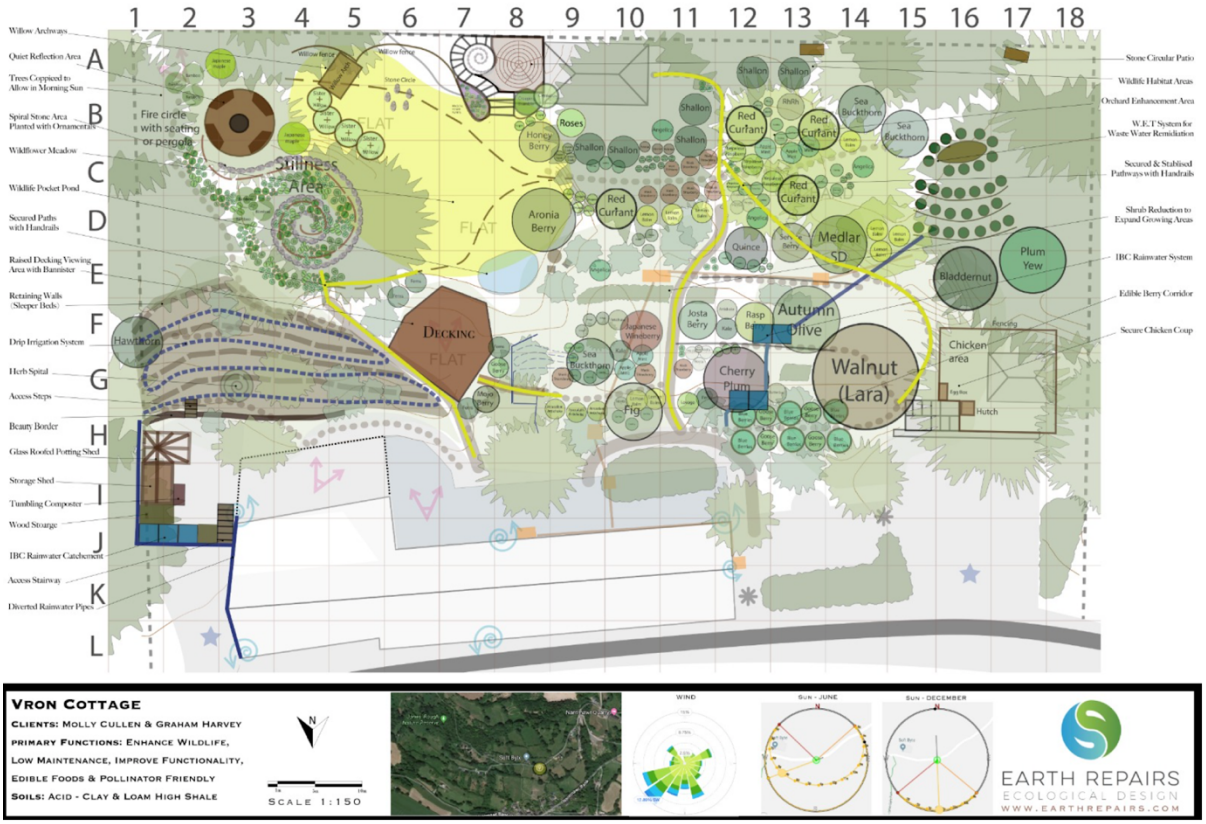

Figure 35: Courtesy of Earth Repairs UK, researcher collaboration final working concept Permaculture design. Map is displayed 1:250 scale.

Source: Courtesy of Earth

The final design, used for the landscape install, is shown in *figure 35*, Finalisation adds the scale, wind, sun angles, species lists and labels. As discussed earlier, a standardized way of communicating designs could be of great benefit to Permaculture designers. Halsey voices the importance of standardization for the industry, to optimize the process and, more importantly, create a common language to collaborate with contractors and other industry professionals.

Observing the design process in action showed how the process can be optimized by using technology, such as drone image capture and digital design. Using this technology saves time and money and improves efficiency.

Observed benefits to the technology assisted design process are:

1. Using digital tools to create base maps.
2. Using Geo Standard colour pallets and symbol libraries.
3. Creating Poly-culture symbol libraries.
4. Creating multiple layers, which can be overlaid.
5. Using landscape symbols.
6. Accessing plant databases for poly cultures and soil types.
7. Ability to work collectively as teams on designs on shared networks.

Box 55: extract from Author's field notes

In a similar context, Perkl (2016) argued a similar case and for the usage of 'Auto Design Models for the creation of hybrid geodesign and conservation connectivity frameworks'. Perkl (2016) identifies an 'Automated Design Model (ADM)' for use in wildlife corridor design, in a similar vein to Halsey's polyculture symbols library, where the 'ADM's primary purpose is to generate detailed vegetation planting designs that may be applied to the interiors of previously modelled corridors (Perkl 2016).

From the perspective of ecological design within the UK, the time of year has an influence over how the design is project managed. From the macro to the micro detail, following from 'patterns to detail' can be time consuming. Predicting the right times for site visits is a core component, as the ecology of the site functions differently throughout the seasons. From an installation point of view, there are tasks which often need rectifying immediately, meaning the overall design is ongoing while micro-detail of microclimates has to be prioritised due to client requests, events or unavoidable circumstances. In this case immediate intervention was needed for grey water remediation management which took priority.

Box 56: Extract from Author's field notes

Summary of Permaculture Design Frontiers

From a professional designer's perspective, the design framework, co-developed by Daniel Halsey of the Permaculture Institute U.S.A, bridges ecological knowledge into a professional industry service. The process utilizes symbol libraries within adobe illustrator, to create effective scaled polycultures. These are identified, through the plant libraries discussed in the previous case study. The standardized scale used is 1:250 allowing for industry crossover recognition. This systemized approach to ecological design provides a solution to time management and global collaboration. It also provides professional outputs, which have been implemented in Permaculture design consultancy, evidenced in this case study.

A Systemic Approach to Group Communication for Cross Cultural Discourses

An Interview with Caitlin Walker, UK

On the quest for effective models of sustainability, the author journeyed through different training programs to better understand group dynamics. Although, initially, this seemed outside of the research boundary, it became evident through the ethnographical methodology of immersion in the world of activists, that the tools and techniques observed in the communication field were directly transferable to sustainable development.

Although not specifically Permaculture inclined, the common thread between all partnerships and projects is communication tools for effective project execution.

Box 57: Extract from authors field notes

The tools, methods and strategies used by enterprises, NGOs, governmental departments and stakeholders are often crucial components between success and failure of a shared goal. In such colossal targets as the SDGs, the researcher was compelled to identify a method of group facilitation. The method would need to translate the needs of *st*akeholders into shared action goals, or, in other terms, create a cross cultural discourse (Scollon 1996), by identifying a semantic approach to cultural analysis and cultural scripts for cross-cultural communication (Wierzbicka, (1994) . This journey of inquiry identified Caitlin Walker, as a gatekeeper in cross cultural and intercultural linguistics, based in the UK, and is known as a pioneer in-group facilitation of international standing.

From observation, when projects don't succeed or fall short of the collective goal it is often due to a breakdown in effective communication. I have noticed this on multiple small-scale operations and larger projects, when the stakeholder engagement doesn't communicate all the needs of the individuals.

Box 58: Extract from authors field notes

In discussion with Walker in 2019, the researcher communicated his intention to discover effective systems for collaboration. In response, a timeline of experience was expressed, which provided foundational knowledge regarding the tools of communication which she had had great success with.

From the discussion:
Caitlin is a director of Clean Learning and the developer of Systemic ModellingTM. She is the author of 'From Contempt to Curiosity' (Walker 2014), which details many of the innovative and transformational projects she's led across communities, from the most dispossessed to leading think tanks.

> "*I graduated in Linguistics at the School of Oriental and African Studies then began systems modelling teaching and learning while at SOAS, volunteering intermediary classes to translate information presented at lectures into different learning styles for the students*."
>
> Interview with Walker

Walker goes on to detail her experience as a youth worker in Kings Cross, bringing cutting edge communication tools to groups of young people. From there, she set up literacy clubs, where children could go to learn to spell. From 1996 – 1999 Caitlin was an Education tutor with the Dalston Youth Project. This was a Home Office run experiment to offer accelerated learning to at- risk students, alongside mentoring to keep them in school.

Walker ran the sessions as NLP modelling workshops and achieved excellent results with the students. The project won a Crime Prevention and Community Safety award for Great Britain. In 1999 she was offered the opportunity to develop her work in a business context and she created the ground-breaking Metaphors@work process. These techniques are available on the creative management section of the Open University MBA program. She has co-designed,

and she co-delivers, a Master's Level module in Coaching and Mentoring at Liverpool John Moores University.

Walker has since developed her modelling skills from small-scale group development to whole scale organisational culture change programmes. She designs and delivers tailor made learning and development programs for addressing diversity, conflict, leadership, merger management and for creating 'learning organizations. Her work is taught and practiced around the world with centres in Russia, Japan, Malaysia, USA and Europe. She has trained a number of in-house trainers, to carry on and develop the work without creating dependency on her expertise. She has systematically tested and developed her ideas in challenging arenas, and her robust products have become sought after learning aids and are practiced in a variety of contexts[1]

Although very little academic research exists in the communication tools for the organization and facilitation of 'social Permaculture', one method of communication modelling known as 'Systemic Modelling' is yielding outstanding results in other industries. Using existing models of facilitation, such as Systemic Modelling, there may be an opportunity to advance social permaculture into the mainstream discussion.

Box 59: Extract from authors field notes

"For any project, communication is key "

Interview with Walker

Caitlin Walker is pioneering the systemic technique with the Department of International Development. She shared her experiences of group facilitation, from which sustainable development and Permaculture could, arguably, yield high rewards if they chose to adopt the

[1] Her clients include: Leyes Group, Said Business School, Oxford University, Liverpool John Moores University, a number of primary schools, Pharmacia, Hull City Council, South Yorkshire Police Service, Bexley Care Trust, New Information Paradigms, Work Directions UK, Crime Concern, BT, Police National Search Centre, Celerent Consultancy, Carbon Partners, Ealing LEA, and Working Links.

same tools. Fundamentally, the use of *Clean Language* in *Systemic Modelling* 'levels the playing field, regardless of topic, as well as helping those voices to be expressed in a way which is collaborative not confrontational' (Walker 2014). The method explores each individual's values and purpose within the system of which they are a part. Walker's discovery assesses the language used in this process of modelling as a 'system' and draws upon a range of influences upon group dynamics, such as the Karpman drama triangle. From a teamwork perspective, DiGirolamo (2007) presents the effect of the Karpman drama triangle, within a workplace context. Awareness of this theory of communication has been essential in resolving conflict within organisations.

Definition of conflict:

> "*A process that begins when an individual or group perceives differences and opposition between itself and another individual or group about interests and resources, beliefs, values, or practices that matter to them*. "
>
> DiGirolamo (2007, p.3)

Although the issues within organised teams, enterprises or initiatives may not always involve conflict, Walker goes on to suggest the ability for individuals within a group to share 'actionable goals' is crucial for the mobility of objectives. It is with a similar process that walker identifies 'common language' or core issues.

> *"If they are problem focused, they are stuck, if they are wishful, they are exhausted, and if they are in outcome there is generally not much action; the key is to explore and develop shared action goals. "*
>
> Interview with Walker

Of a similar understanding to Walker, Shmelev (2015) discusses, in detail, the roles portrayed in the Karpman drama triangle, labelling them as Victim, Persecutor, and Rescuer roles and suggests a similar framework, to alleviate individuals out of the sequence and into action. This is often identified through the recognition of 'states, behaviours, secondary gains, payoffs and marker words'. In this context, Walker suggests the language patterns of individuals are

relevant for the identification of current issues in alignment with, or moving towards, shared action goals. Shmelev (2015) states that generally ,'the situation is part of a broader context, to solve the problem one needs to proceed to a meta position and rise above the situation, and its vector is directed at solutions, which are dictated by the goals of the subject.' Walkers systemic suggestions shadow the 'Schematically described process which passes the following stages':

1. Taking the situation as it is.
2. Selecting a goal (visualizing the "image of what is possible as a prototype of the real" (Petrovskiy, 2010 cited by Shmelev 2015).

In relation to sustainable development and communities involved in work on climate change, arts and education, the members of Black Bulga (Australia), as communicated by Evans (2018), used the awareness of the 'Karpman Drama Triangle' to 'unify their commitments and shared values of social justice for Aboriginal Australians and environmental sustainability'. This conveys their deep commitment to transition their region from fossil fuel dependency to clean energy (Evan 2018). Similarly, to Walker's model of using 'Clean Language' to develop shared action goals, Evans (2018) suggests facilitation aids their process away from conflict.

> "*Our unifying passion is our shared values for social justice and environmental sustainability. Our facilitator introduced us to the Karpman Drama Triangle as a model of destructive interaction that can occur between people in conflict. "*
>
> Evans (2018).

Similar to Mollison's (1988) approach of 'systems thinking', communication can also be systemised to optimize efficiency and create effective shared action goals. The 'Clean Systemic approach' acknowledges each individual as part of the whole system, thus creating the conditions for groups to collaborate (Walker 2014);

''Generally, I would speak with the decision makers, and I need to ask the group around two to three questions each. Usually, this works with three people to get an accurate idea of where they are at, or where their focus is.''

Interview with Walker

Walker's enthusiasm for global sustainable change was demonstrated, when discussing the potential for 'systemic modelling' to emerge within the sustainable development sector, at policy level, suggesting;

"This could really change the world, if you can package the model into a specific strategy to facilitate shared action goals"

Interview with Walker (2019),

Communication tools

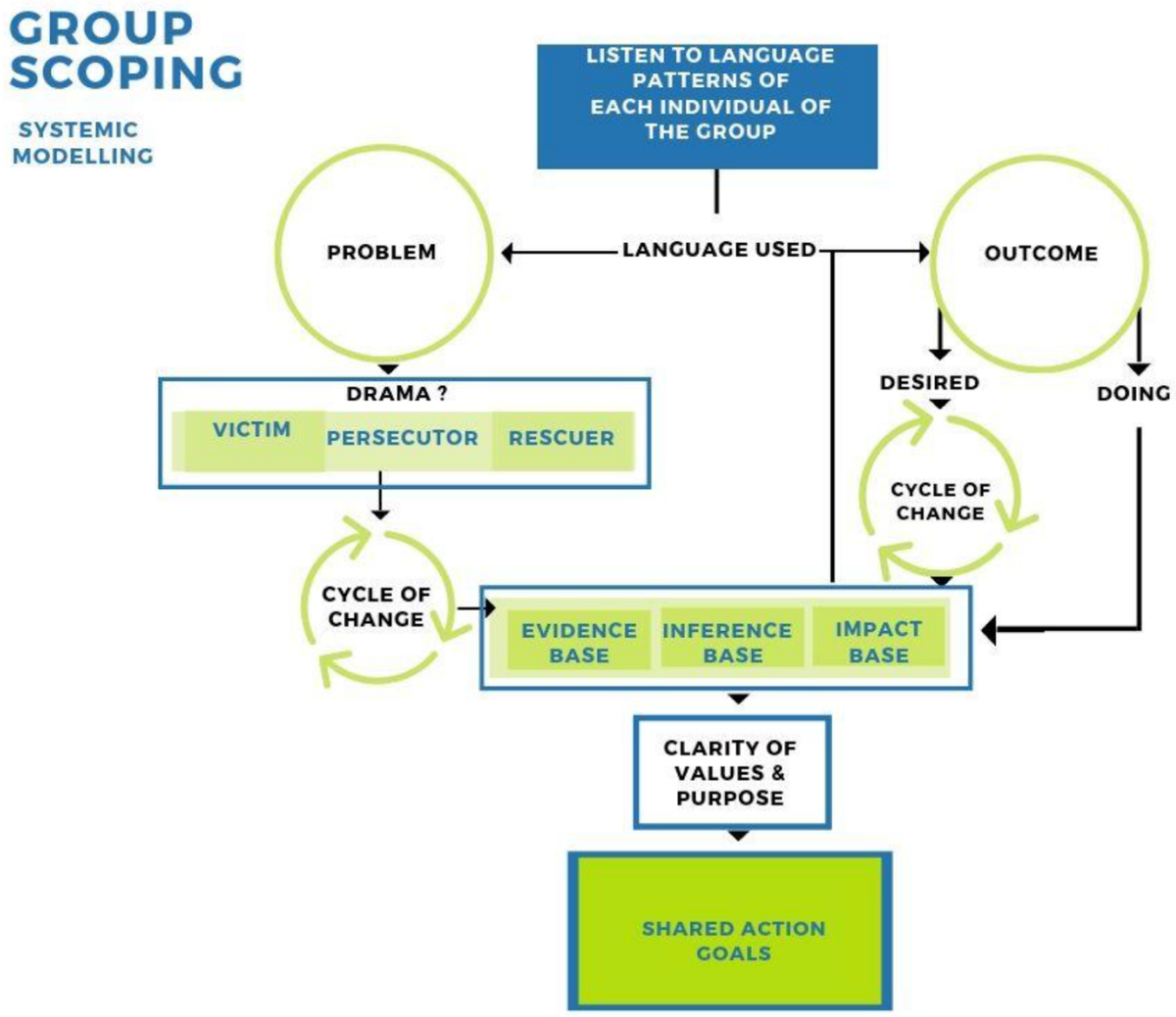

Figure 36: Authors macro adaptation of the Systemic Modelling' procedure, using Clean Language and the Cycle of Change, (Walker 2014, p 35)

On the topic of systems change and developing a common language pattern to assist interdisciplinary cohesion, Walker sheds light on what she found most effective.

> *'In organisations, companies and policy makers, this systemic modelling works when you facilitate from top down".*

Walker explained how the language patterns of individuals allow an insight into how they are processing their interactions within the enterprise, or community, of which they are a part.

Figure 37: Micro detail of the Cycle of Change for group communication on collaboration

The visual adaptation, shown in figure 37, of the Cycle of change for group communication and collaboration, provides an effective method of feedback, outcomes, and action planning known as developmental tasks (Walker 2014, p.35).

Interestingly, from my observations, when interacting with some social or environmental activists, the drama sequence can be often witnessed; such as the position of 'saving the planet' or persecuting behaviours, which are believed to be in opposition to one's belief systems. This often results in a victim state of being, which degrades a person's ability to

create social or environmental change. The awareness of these archetypal behaviours can be rectified with the 'cycle of change'.

Box 60: Extract from authors field notes

Summary of A Systemic Approach to Group Communication

Cross cultural discourse mitigation is a strong component to achieving the SDGS, due to the varied value-based ideologies within each society. The topic of 'Systemic Modelling' used throughout many industries merits further inquiry towards its use within the Major Groups and partnerships, who aim to achieve the shared actionable goals. In relation to mainstreaming permaculture into an evidenced informed pathway from policy makers, Systemic Modelling could assist in bridging the gap between permaculture terminology and ideology, with that of policy makers and other scientific disciplines.

CHAPTER 7

Discussion

As the case studies and interviews presented are from diverse stakeholders, this document explores current working models within different biomes and niches to yield interesting discoveries. It was noted, the sheer scale of the Permaculture world prevented deeper exploration, yet the author attempts to give the reader an idea of potential applications, which may assist stakeholders and future researchers with an interest in Permaculture. Despite the initial intention for the direction of the research, discussion with key individuals directed the research towards topics such as technological advancements in digital design, and relevant communication tools, which are viewed as practical contributions to aiding the industry. These factors have not been explored in this context before.

The development of knowledge in permanent agriculture, as a system for assisting global environmental conservation whilst answering the cries of food scarcity from international organisations, has stimulated a journey for the author. This journey is just beginning and has not ended on the completion of this research.

The journey of a researcher, in any social-environmental field, seems fraught with apprehension as the global scale of biodiversity loss is matched by the requirement for worldwide humanitarian aid. This can often seem overwhelming, disjointed or unmatched by governing solutions.

Box 61:Extract from authors notes

The holistic nature of Permaculture crosses multiple sciences (Holmgren 2002). Existing scientific disciplines, such as conservation biology and social science, struggle to perform interdisciplinary. This is articulated by Fox et al (2006). Fox identifies the 'ecology of threatened species and ecosystems as the foundation of conservation biology, however,

conservation actions are, ultimately, human behaviours and require the social science dimension, to attain effective actions of conservation.

Furthermore, Fox et al (2006) classify the strongest barriers to integrating the social sciences into conservation action as;

> '*(1) the lack of common vocabulary between biologists and social scientists, (2) traditional academic reward systems discourage interdisciplinary collaboration and applied problem solving, (3) the lack of funding for collaborative work, and (4) limited opportunities for interdisciplinary collaboration'.*
>
> Fox et al (2006, p.3)

This echoes the challenges voiced in the author's discussions with McKenzie, on the collaboration frameworks within South East Asian Permaculture outreach programs. Specifically, this reinforces the concern around the 'lack of a common language'. This issue has also been brought to the fore in the work of Halsey, interviewed in previous chapters, who strives to bridge the gap between industries. He has done this by creating an internationally received, visual digital common language which is justified through the principles of Permaculture, increasing the efficiency of systems. One mode of interdisciplinary pattern language, which has been discussed, is the use of SDGs. This is highlighted in the discussion with McKenzie.

Drawing upon the foundation of cross cultural analysis, by the use of non-ethnocentric unbiased language (Wierzbicka 1994), key markers such as 'cultural scripts' for cross-cultural communication, are crucial in understanding the standpoints of individuals belonging to the discourse groups of both Permaculture and policy making. Acknowledging cultural biases, in relation to ideologies, provides insight into the obstructions which impede the spread of Permaculture into mainstream policy making. This highlights that solutions could, potentially, be found in cross cultural translation through existing frameworks of assessment. In the case of this research, the Ecosystem Services framework was that language model, to record the participant impacts through ethnographic data recording.

Permaculture, in its own domain, has its set of principles, ethics and belief systems which form the culture of its participants. From a cross cultural perspective, this independent language system, reserved solely for PDC graduates, could be perceived as a barrier to mainstreaming, by isolating the 'culture' solely to its participants. It should also be noted that the variable degrees of intercultural discourses within the Permaculture movement are far ranging. For example; participants which belong to other overlapping cultural variables, such as individuals from the global north and global south.

Box 62: Extract from Authors notes

In response to the global cross-cultural issues, it appears Mollison (1988) has delivered a cross cultural language and an independent personal identity, which merges social, economic and environmental sciences, into a digestible format.

Box 63: Extract from Authors notes

Fox et al (2006) Give evidence to the challenges voiced by interdisciplinary participants of their study such as:

> *"I definitely feel limited by my ecology-oriented training, as I am now faced [with] working with species whose threats largely involve direct exploitation by economically struggling local people, and feel that I could learn a lot from educators and social scientists, however, I also find myself frustrated at times with the social science literature" (natural scientist with a doctoral degree.)*
>
> *Fox et al (2006, p.2)*

It appears the key difference between most science studies and Permaculture, is the merging of earth, social and economic sciences, leaving no gaps for impact action in each domain.

Box 64: Extract from Authors notes

Revisiting Veteto and Lockyer (2008) who suggest societies' interactions with the environment, as a whole, are heavily influenced by capitalism. This dictation, of how communities interact with the environment, requires different conditional modes of social, environmental and economic commitments, to encourage localised reliance and sustainable living practices. Differentially, Permaculture's core ethical components are founded in not only environmental, but social sciences, offering a unique toolset which is not encompassed in any one individual science. Referring to the Karpman Drama triangle, discussed in the interview with Walker, often the language patterns, within the roles of persons who feel ill equipped, incapable or victim of external circumstance, elude the person of self-responsibility Shmelev (2015).

Permaculture, at its core, is the process of creating self-reliance for individuals and communities, by encouraging self-responsibility in our interactions with nature. It could be implied, Permaculture gives the individual the first two steps in moving toward in the form of 'shared action goals', by firstly acknowledging what is, and secondly, selecting a goal, visualizing the 'image of what is possible as a prototype of the real' (Petrovskiy, 2010 cited by Shmelec, 2015, p.2). This is reciprocated in localised self-empowerment, envisioned by Mollison (1989) and Holmgren (2007). Liftin (2012, p.2) suggests, the 'collective efforts toward self-empowerment' are in response to 'the life- alienating forces of technocracy, the administrative state and global capitalism; effectively moving away from victim roles.'

Author's Perspective of Conducting the Research

Throughout the evaluation, it is difficult to reflect without bias, however, on rereading the material, I am in awe of some of the interview notes recorded throughout the process. The challenges of a researcher documenting such a phenomenon as Permaculture cannot match the hardships of some of the beneficiaries documented in previous chapters. Many of the

contributor's lives are directly tied to the implementation of the knowledge they have received in PDCs and other Permaculture offerings. In the global south case studies and interviews, it may be helpful to skim over interview transcripts and field notes, theorising over moral conduct or the relevance of practical operations, however, the researcher's articulation cannot serve the true implications of Permaculture's imprint on so many human and animal lives, including the vast ecosystems which support them. The gifted privilege of documenting the efforts of activists is a truly humbling experience and one that, at its core, aims to identify 'good practice' and evidence its impacts, through which small seeds of hope for humanity have emerged. These optimistic glimmers identified Permaculture action in rectifying deforestation, assisting humanitarian efforts in conflict zones, relieving stressors in disaster areas, educating in refugee settlements, and in executing professional services in the consultancy domain.

The enchantment of the conscious connection between cultures and their environment stimulated the author to remain aware that impacts and results are generally mere assumptions, from the perspective of the researcher. This is similar to the point made by Gregory (1983, p.1) who suggests 'the tendency to take for granted one's own cultural view and to evaluate others' behaviour in terms of it, increases the tendency for misunderstanding', yet in policy such as the SDGs; these assumptions are developed by a range of stakeholders who don't necessarily originate from the cultures upon which the policies are imposed. Deciphering the philosophical underpinning of knowledge transference and research, Chai (2002) states,

> "*It must not be assumed that the researcher and the practitioner, even within a particular cultural context, hold similar attitudes and definitions of what constitutes knowledge".*
>
> Chai (2002, p.3)

Interestingly, one such assumption is that the global south are in a deprived state of being, while not exposed to the infrastructure of the global north, outlined through the targets of the SDGS, such as target **8.1** '*Sustain per capita economic growth in accordance with national circumstances and, in particular, at least 7 per cent gross domestic product growth per annum*

in the least developed countries, and **9.1.1** *Proportion of the rural population who live within 2 km of an all-season road,* ***9.C.1*** Proportion of population covered by a mobile network, by technology. The hypothesis evidently positions the targets to assist the SDGs, however, the assumption could debate, 'who is actually a beneficiary of the actions?'. For example, 'the road effect- zone' is well documented to have a detrimental ecological impact outward of >100m (Forman 2000). This is particularly valid in bio-diverse ecosystems, such as the Amazon rainforest. Barber, Cochrane, Souza and Laurance (2014, p.1) express the connection between ecosystem loss and roads in the Amazon; 'nearly 95% of all deforestation occurred within 5.5 km of roads or 1 km of rivers'.

The communication models discussed in the previous chapters aim to provide evidential accounts, avoiding inference, to decipher whether 'impacts' are relative and respective to cultural, physical, emotional and spiritual needs of the individuals affected.

Along the journey of researching such a vast topic area, the author questioned the process of events, which ultimately laid the foundation for interactions with key actors. The philosophical underpinning of the knowledge acquired, interpreted and actioned, can be compared with the transcriptions of Chia (2002), who suggests there is always scope for a researcher to lean towards a particular viewpoint, based on our own identities.

> "*Research orientations are, therefore, inextricably linked to philosophical preferences which are, in turn, influenced, though not necessarily determined, by the embedded collective histories and cultural traditions within which our own individual identities have emerged*"
>
> Chia (2002, p.3)

The Call for a Common Language

Whilst the UNSDGs provide measurable targets, the core ethics and principles of Permaculture seem to resonate harmoniously with the agenda. Discourses such as the SDGs aim to become shared actionable goals which assist in forming partnerships to achieve the

targets within each goal. The development of how to achieve the 169 targets calls for cross cultural discourse facilitation to bridge the gap between frameworks such as permaculture and policy makers.

Shown throughout the review of literature, Permaculture discourses cover many topics. At its core, principles guide the interconnected nature of systems planning, in a similar context to existing models used by policy makers, such as ESA. Applying a systems approach to ecological and human settlement design has identified micro details such as the refinement of agricultural systems in order to achieve the goals. One such approach heavily documented throughout this study has been the use of agro-forestry.

The link between deforestation and climate change has been defined, however, methods to rectify ill forest management are of crucial importance for the movement towards a sustainable future. The 'vehicle of change' in the Indonesian region shows promising developments through indigenous community forestry management. Although it is difficult to determine the impacts on a regional scale and ecological basis, due to restricted or unchartered data sets, there is still support from NGOs and governmental departments for a variety of community forest systems. Importantly, the principles of forest gardens are suggested to support indigenous communities to make livelihoods in the Krui District, Sumatra, Indonesia, from the collection of resin from the damar tree (Shorea javanica), whilst preserving biodiversity. Statistically, Poffenberger (2006) states, in a comparison of sample plots within rubber estates, primary forests and damar agroforest;

> *`There were 230 plant species in rainforests, 120 in damar forests and only ten species in the rubber estates. In the rain forest sample sites, the bird species enumerated were 130 vs. 70 in the damar agroforests and five in the rubber estates. Damar forests were also found to be important habitats for endangered mammals such as the Sumatran rhinoceros, the Sumatran goat, tigers, tapir, gibbons and siamangs (monkeys). The mature damar forest gardens in Krui District cover 54,000 hectares.'*
>
> (Poffenberger 2006, p.60)

The extent to which Permaculture is informally in practice within South East Asia can be observed in the forest garden polyculture systems throughout 'lowland insular, and the mainland' which span 'millions of hectares'. These systems provide a continued source of livelihoods (Poffenberger 2006) and, currently, fall victim to the threat of large-scale expansion of estate crops like palm oil, coffee and rubber.

The critical role of communities, in the conservation of biodiversity and managing hydrological functions, has been identified (Poffenberger 2006, p.4), however, the limitations of informal land rights play a pivotal role in deciding the permanence of agriculture. This is not limited to the global south, as cases such as urban agriculture projects of the UK also suffer from land tenure rights. This has resulted in revolutionary movements such as 'guerrilla gardening' where land is commandeered illegally to raise crops (Hardman 2012).

From a researcher's observational standpoint; the energy inputs required to communally cultivate cost effective agroforestry, using Permaculture design systems, in regions at risk of suffering external corporate exploitation, such as palm oil plantation extensions, is a constant barrier to commitment. Official ownership, contracts or agreements alleviate some risk and despite this, Poffenberger (2006) concludes 'communities are continuing to play an important role in biodiversity conservation and the protection of forest cover'. This coincides with the findings of Fox et al (2006), endorsing the call to bridge the gap between conservation biology and the social sciences.

In the global north, there have been numerous periods where the common language between society has been 'Food' such as the previously outlined 'Victory Gardens' and the more recent Incredible Edible Movement (Warhurst and Dobson 2014). One might also assume, through its economic value, 'food' and the products of agriculture are the common language of global land use transformation. Diverse outcomes of food production can rectify a local economy (Warhurst and Dobson 2014, p.4), or potentially destroy the supporting ecosystems which are responsible for sculpting localised culture (Weinberger 2013: iv)

Potential Barriers to Global Mainstreaming

The perception of permaculture, as a movement, appears to stand in direct conflict with capitalism and the current economic model. This is iterated by permaculture's foundational ethics and principles with the values of 'earth care, people care and fair share' at its core. The conflict exists where corporate profit is prioritised over these founding ethics. Klein (2014) heroically emphasises how viable solutions to climate change are ostracised do to the designed exploitive agendas of corporations, in times of global crisis. It is with this notion, the main barrier towards the global mainstreaming of the pro-localisation model permaculture, is the potential of loss of power TNCS hold in governance over the consumer.

Moving away from dependency upon international TNCs for sustenance, Holmgren (2007) builds his tested theories around localised self-sufficiency; particularly in the food security domain. The movement of 'Permaculture living' encourages individuals and communities to work towards the management of natural local resources (Gray 2007), which would be greatly assisted by democratic decentralisation (Poffenberger 2006). This can be seen as a direct dissent to the agendas of many international capitalist agro-foods TNCS (Weis 2010).

> *"Democratic decentralisation is an effort to enhance popular participation in resource stewardship and formally institutionalise it within a governance framework*".
>
> (Ribot 2002; cited in Poffenberger 2006, p.61).

According to Poffenberger (2006), favourable arguments for decentralisation include 'greater equity in resource access and greater management of economic efficiency. This is stated in terms of 'reduced transaction costs, better matching of services to needs, mobilisation of local knowledge and increased public sector accountability' (Poffenberger, 1996). Historically, the decentralisation policy reforms of the central government in Indonesia extended authority to the provinces. This had an adverse effect, resulting in the acceleration of deforestation. From these examples, it could be inferred that the effectiveness of decentralisation, for resource management, is diminished, if not supported by national policies which do not undermine local initiatives (Poffenberger 1996 cited by Poffenberger 2006, p.62).

The barriers to Permaculture's acceptance as a mainstream academic contributor were found to be two-fold.

1. Permaculture has been overlooked from academics due to its fundamental holistic approach, contradictory ideologies and refusal to compromise.

2. Another standpoint suggests there is a lack of empirical evidence to substantiate permacultures impact claims (Ferguson and Lovell 2014), due to sustained scientific seclusion. This has been documented to have prohibited permaculture from becoming an evidence informed pathway to policy.

Intercultural barriers within permaculture

Despite the increased uptake of Permaculture, concerns over the PDC accreditation system were voiced throughout the research in the global south. It was noted; perceived limitations of the accreditation process, potentially, pose a barrier to the spread of the Permaculture message and deter knowledgeable teachers. Prospective teachers could feel deflated and become doubtful of their credibility to teach. The global south has evidently, different limitations to the global north, and the costs of a privately conducted PDCs can range from $200-$2800. The ability to fulfil accredited PDC requirements, whilst creating a cost-effective delivery in the global south, was voiced to be difficult, due to the requirement of external credited teachers.

In conversations with PDC students, it was noted 'value perception' has influence over the choices made by potential PDC attendees in their searches for courses. It can thus be assumed that 'non-accredited' courses may be perceived as inferior.

Within the UK, the Permaculture Association reported a reduction in persons taking PDCs resulting in alternative delivery methods such as weekend delivery and courses spread over a year.

Box 65:Extract from authors notes from Interview with head of research Permaculture Association UK 2019

This same strategy is documented successfully in Timor Leste, where farmers are time scarce to undertake a complete 72hr PDC, identified in the author's interview with McKenzie and Lemos (2018). Potentially, the reduction in numbers may be due to the increase of online resources and educational material for self-study, as explored by Luchkina (2016). This may be a contributing factor to the reduction of PDC participants in the UK.

Although the standardised development of teachers, through an accredited system, has some strength. From the researchers' observations, it is difficult to create a global baseline of cohesion, when cultures, pressures, economies and access to resources differ so drastically between the global north and the global south.

Furthermore, it could be argued, general access to pre-PDC education such as schooling and university differs considerably from the global north to the global south; a point made in the discussion with Halsey, who had witnessed challenges in facilitating education in different countries due to differences in foundational knowledge.

Box 66: extract from authors field notes

Additionally, there is potentially a cause for concern when creating a global model of certification when participants often have such varied experience or knowledge yet are preparing for the role of ecological design. Evidently, however, not all PDC graduates go on to design ecological spaces, as the Permaculture paradigm shown in the Permaculture flower (Holmgren, 2007) has many areas of expertise to develop.

In the author's interview with Halsey, the barriers to teaching 'digital Permaculture design', in some parts of the world, made the task initially irrelevant, as processes and understanding of other aspects were needed before attempting the digital process, as well as the resources.

The complexities of PDC content may pose a challenge in this context. Cost variability is one other contender for limiting the global mainstreaming of Permaculture, with access restricted to those who can afford private tuition or those facilitated by non-profits (a notable core delivery system for global south PDCs, collated interviews in chapter 3). This results in dependency upon external support for participants who may not meet the financial requirements.

An example of Permaculture education, facilitated by non-profit systems, is the 'Greening the Desert' program in Jordan, orchestrated by Geoff Lawton in 2001 (Lawton, 2010). This evidenced 'how Permaculture can dramatically change lives by transforming the environment (Permaculture Institute 2007). The project evidenced the dramatic transformation of one of the world's least productive agricultural spaces; desert, into species diverse food gardens by educating through inclusivity. This initiative again evidences how Permaculture can facilitate a number of the SDGs. In a similar way Lemos (2018) displays how the SDGS are addressed by the educational publication *(figure 4).*

Partnerships

In support of the frameworks outlined by the UN to achieve the SDGs thorough partnerships, Permaculture organisations are targeting agriculture and its beneficiaries and stakeholders. This is an indirect response to the goals, in particular, to work in collaboration to eradicate poverty (Goal 1). Rural women farmers and children are recognised as being some of the most vulnerable members of society and are, historically, the least supported. The SDGs Major Groups aim to rectify this. This provides an opportunity for Permaculture, as a movement, to fulfil the dire need of resources, support and education. Permaculture has already been actively fulfilling these needs on a local level, as reflected upon in chapters 4 and 5. The research for this study has identified the missing components of micro financing and consumer pipelines, within the agriculture sector, which would support small farmers in rural spaces (WFO 2019). The reflective account of Indonesian organic primary production emphasises this shortfall and offers solutions which may be useful for global stakeholders exploring resolutions.

Additionally, the influx of people into urban spaces is resulting in the requirement for new green spaces to support community, health and well-being (Hardman, 2012). It can be noted that many Permaculture projects are not funded, or have little, if any, affiliation to UN subsidiaries or partnerships.

Through the observational accounts of this study, the affective education using the PDC in the global south, a compelling case is proposed towards permaculture discourses in meeting the targets of the SDGs which merits sincere support from the UN Major Groups, who are actively stating microfinance models coupled with education for rural women farmers are paramount. This would mitigate funding inconsistences for permaculture teachers yearning to deliver effective training to those in need. Effectively subsidiaries could make possible, higher frequencies of high-quality permaculture training.

Box 67: Extract from authors field notes

Evaluation

As the demands of sustainable development increase, Permaculture has answered the call with technological advancements. These advancements provide the following solutions:

1. Made Permaculture more accessible.
2. Identified the support needed for rural women farmers.
3. Professionalised technological design systems.
4. Developed systems for collaboration.
5. Integrated rather than segregated the skill sets of other industries.
6. Increased the resources available to PDC graduates to be more effective at socio-ecological design.
7. Creatively responded to the changing technological advancements such as 3D Imaging and digital design.
8. Identified natural succession as a global model for forest gardens in response to a number of climates, environment, biological and social issues.
9. Identified economically viable models of sustainable agriculture.
10. Developed existing working models of education for vulnerable farmers.

The following table is a collated framework checklist, detailing the steps to planning an ecological project. It is built from the requirements of the organic federations, WFO and Permaculture guidelines which guide decision making and give direction to inputs.

Authors adaptation of decision-making guidelines for sustainable development in, regenerative, resilient agricultural systems, adapted from (Mckenzie and Lemos 2018: IFOAM 2019; WFO 2019) :

- Improve the storage, marketing and transport of produce are integrated systems.
- Improve the soil, land and conditions for production every year.
- Repair damaged soil and restore natural biodiversity.
- Maximize production on agricultural land already in use, in an organic and a sustainable way.
- Are affordable for all community members.
- Form community cooperatives and farmer groups that share resources, costs, techniques and knowledge.
- Are culturally appropriate.
- Are diverse in yields and types of land management.
- Use of most efficient, relevant design techniques available.
- Implement Full Cost Accounting.

CHAPTER 8

Recommendations

The vast subject areas of sustainable development and Permaculture are so diverse that narrowing down recommendations is a difficult task. The comprehensive work of Mollison (1989) and Holmgren (2007) laid a solid foundation for the movement towards regenerative environmental and social action. Since then, many have embarked upon the journey of 'regenerative living', yet only in recent years have governing bodies, such as the UN, stressed the enormity of the global stressors.

Amongst the movements in policy reform, the conclusions of this text exhibit the parallel agendas of the SDGs and Permaculture. Although not policy driven, Permaculture's 'tried and tested' model of decision-making presents a healthy case for acceptance in how the agendas can be fulfilled. Contextually, the decision-making process of Permaculture, follows a similar process to Ecosystem Services Frameworks which are directed by principles and ethics. In the case of Permaculture design, the predisposed ethic 'Earth Care' governs the ongoing process, which acts as a guide to override one's personal greed, whether that be a corporate entity, political party or an individual. Concurrently, the complex dynamics of multiple stakeholders poses many challenges in creating cohesive shared visions, resulting in the continued debate as to how stakeholders communicate effectively and is suggested as an avenue for further experimentation and research.

At this stage, the general consensus between politicians, NGOs, and the general public is collaboration towards large formalized objectives, through The SDG umbrella goals which provide that framework. The Major groups orchestrating the forward momentum of each target hold huge responsibility, which, in turn, have their individual goals and targets to achieve. To ensure successful collaboration, the same systems language needs to be adopted.

Interestingly, the systems language, such as the SDGs, and other recognised buzz words, such as 'agroforestry', have been identified as a successful dialogue when collaborating or consulting between NGOs who have similar goals.

Box 68: Extract from authors notes from an interview with McKenzie (2019),

In cases of CFM programs throughout South East Asia, successful projects in conservation, against the suppression of 'monoculture estate expansion', resulted from the collaboration of NGOs and policy frameworks.

Crucially, 'systems language' creates the space and foundations for ease of collaboration, whilst moving away from contempt shown by the work of Walker (2014). Systems language is especially applicable in cases with dramatic consequences that result from failure.

Box 69: Extract from authors notes

Acknowledging the coordinating system, and building projects around the laid out goals, can fulfil agendas which promote localisation, such as can be seen in the 'grow food revolution', kick started by the famous 'Incredible Edible' program, who's pioneers identified 'food as the common language amongst the community (Warhurst and Dobson 2014, p.6). In agriculture the main renowned representative international organization is the World Farmers Organization who foster the economic viability of farming activities, to improve the livelihood conditions of farmers, their families and the rural communities where they work (WFO 2019). At the local level, a need for further research on the suitability of Full Cost Accounting, and the gathering and processing of data would assist more accurate reference values, this is also echoed by the Permaculture Association who also acknowledge a lack of data (Goldring 2014).

Suggested by WFO (2019) and FMG (2012), a central common platform for collaboration would make the task easier with a consensus of key performance indicators. A fundamental

function is their assistance in identifying key practices and if their impacts have a positive or a negative impact.

In order to fulfil this requirement, recommendations from working models of sustainable agriculture show the additional need for demonstration farms; supported until local uptake of Permaculture is saturated. Upon completion of demonstration farms' general objectives to educate the local stakeholder, subsequent retirement of the farms may surface, due to the reduced necessity of the surrounding communities, unless funding and longevity is planned, as has been obtained by the successful 'Incredible Farm'.

The development and support of demonstration farms would benefit from recruiting a full cost accounting model (FCA) and evidenced impacts, suggested by IFOAM (2019). Demonstration farms should adopt cultural sensitivity (McKenzie and Lemos 2018) and, additionally, intertwine applicable targets of SDGs to provide a robust evidence base and a balanced approach when considering interventions. This is also effectively demonstrated by McKenzie and Lemos (2018), shown in figure 4. An example of this would be Martin Crawford's 300 species rich Forest Garden in Devon (Crawford 2010). Interestingly, in tropical environments of the global south, a misinformed judgement of sustainability on forest clearing for cultivation can be viewed in a negative manner, however, Poffenberger (2006) precisely informs that the main catastrophic activity is static clearing and shortened fallow periods lasting up to 5-7 years, which involves the felling of young secondary growth.

In the debate as to whether traditional methods of forest swidden cultivation are sustainable; the longitudinal study of effects of forest cover, is highlighted by Poffenberger (2006) whilst documenting forest dwelling communities. The study focuses on 'the Ratanakiri Province in North-eastern Cambodia which showed little change in total forest cover over a 50-year period, only a rotation in the mosaic of land use systems' (Fox, 2002). This provision of evidence, in favour of traditional systems of forest clearing for cultivation and allowing natural forest regeneration over 10-15 years, highlights a sustainable anthropomorphic interference which fundamentally conflicts with the more recent sedentary methods of 'slash and burn'. These methods are often associated with mono-culture agriculture and can be seen throughout the tropics. Combined with the advanced components of forest gardens, such as planting polycultures and ensuring the correct spacing for mature canopies, the management

of energy inputs can be reduced (Crawford 2010). The result also abolishes the need and use of chemical fertilizers, which are used to rectify soil depletion (Poffenberger 2006).

Critically, understanding the conflict of interest between International capitalist agro- food TNCs (Weis 2010), and the SDGs along with efforts to stabilise the climate crisis, whilst ending poverty, is fundamental towards the successful implementation of strategic development of small-scale agriculture.

Klein (2014) iterates the intwined corporate influence, profiting from the climate crisis, which without attention, stands to prevent affective solutions such as permaculture mitigate climate change, and other issues of which the SDGs are founded upon.

Toward an Evaluation Framework

Through an assessment of a combination of the guidelines from IFOAM (2019); the principles of Permaculture (Mollison, 1989); decentralisation policy discussed by Poffenberger (2006); and an interview between the researcher and McKenzie, recommendations for 'speaking a common industry language' were identified. The principles outlined in the National Ecosystem Approach framework are industry recognised for ecosystem services. If Permaculture was applied through a planning and evaluation lens, such as this, it may receive credible results, while meeting industry recognised criteria (http://neat.ecosystemsknowledge.net/valuation-tools.html). Importantly, a crucial variable within the two systems of design and assessment can be viewed through an assessment of priority. Permaculture gives priority to Earth care as its founder ethic, whereas ecosystem services lead with beneficial outputs for society, by focussing on what desirable and interdependent benefits society can gain from nature. If both of these priorities were brought into equal measure, harmony between the two could be found. Concurrently, often language within the ES literature draws attention to; 'specific measures [being] required to obtain or preserve the necessary quality and quantity of ecosystem services over time and in the long term' (Carter, Kass, Everard and Scott 2013), whereas Permaculture aims its efforts towards regenerative practice (Mollison 1989).

ES principles were used in the semi-structured interviews, as a guide for topical conversation, and assisted to formulate the researcher's comprehensive understanding of projects and

their sustainable approaches. Although the cases were not critiqued under the Ecosystem Services Framework, the awareness of the principles assisted greatly in the exploration of motives, impacts, and future planning.

Interestingly, the argument for a 'common language' continued to surface between most stakeholders within the study. The ES framework was identified as being a candidate for application, to be used in the designing of partnerships and projects. While the ES model, potentially, provides a tool set for future visioning and evaluation, the driver of human gains from nature should also be integrated, and ethically assessed, throughout the process of Permaculture's ethical design and its governing principles.

The Ecosystem Services- A Futures Toolkit

Provided as a diverse tool to inform; policies, land management and programmes which support decision making, the 'future's toolkit' process is a framework for scoping alternative scenarios for Strategic Environmental Assessment (Carter, Kass, Everard and Scott 2013). The scenarios involved in the process can be used to discuss a *Deliberate Monetary Evaluation* (Carter, Kass, Everard and Scott 2013). The tools can be used in sequence or individually, however, the Futures tools are evidenced to be particularly effective at the level of 'ideas, decision-making and evaluation in policy and practice' and 'provide consistent framework and language' (Carter, Kass, Everard and Scott 2013).

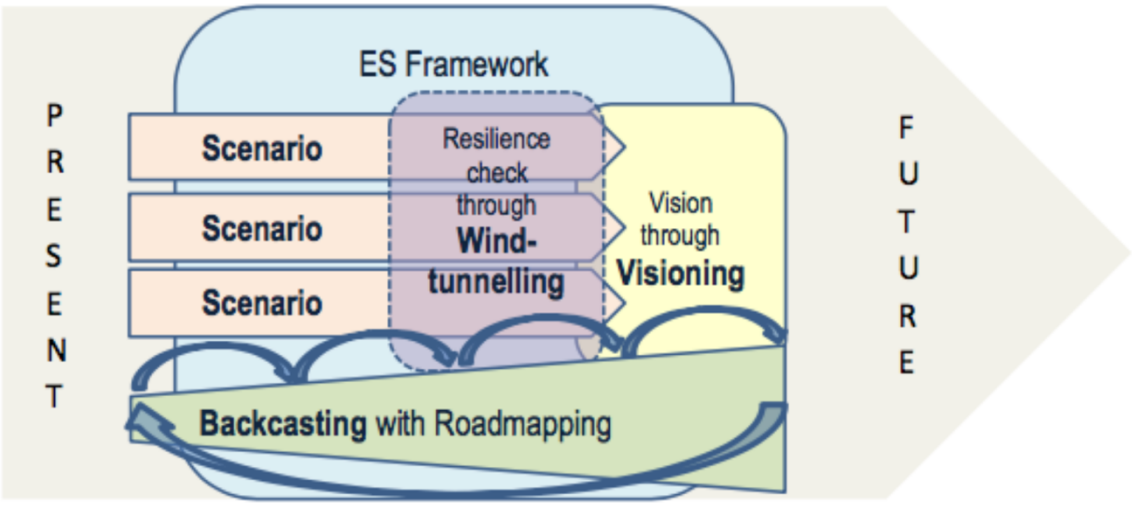

Figure 38:Backcasting with roadmapping Carter, Kass, Everard and Scott 2013).

Backcasting with Roadmapping.

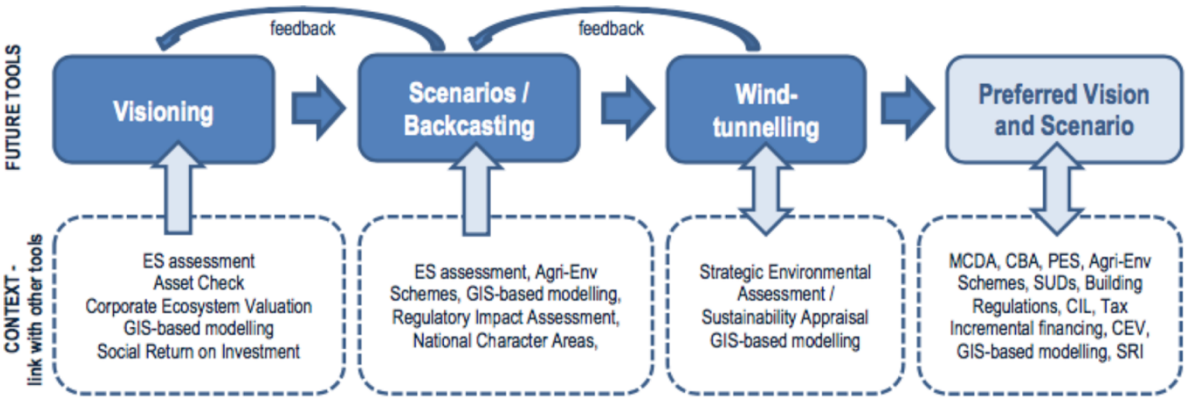

Figure 39: Ecosystem Services (ES) proofing futures tool in the context of regulatory, incentive and valuation tools(Carter, Kass, Everard and Scott 2013)

Combining Permaculture design with an industry perspective of Ecosystem Services relates directly, to the proposition of using a common language and supporting evidence to understand the Permaculture design process. Often scenarios developed by Permaculture experts may be understood by other graduates of the PDC course, however, may not be explicitly grasped by beneficiaries, partners or policy makers who have a different outlook and discourse.

Within the ES framework, a back casting approach would identify and assess the exact components needed to 'obtain or preserve the necessary quality and quantity of ecosystem services in the long term, and the agreements between potentially conflicting demands upon them to ensure that overall ecosystem functioning is maintained' (Carter, Kass, Everard and

Scott 2013). Through a Permaculture lens, one may process decision making with the ethics of Permaculture, effectively giving the designer or stakeholders a compass to navigate conflicting components with the ES framework.

When creating Permaculture frameworks for integration with the Ecosystem Services approach it would be important for attention to be given to the formulation of a system of evaluation. From an ecosystem services standpoint, Carter, Kass, Everard and Scott (2013) suggest the following considerations;

- What the estimated impacts of the proposed interventions within ecosystems will be on the ecosystem, including the provision of goods and services.
- Economic, social and environmental cumulative effects of interventions and non-interventions associated with each scenario.
- Influences over inter-relationships across sectors and scales
- Shifting focus from Snapshot future state, to linkages within interconnecting systems such as processes, interactions and dependencies to develop wellbeing and resilience in the environment and society.
- What are the 'fundamental, desirable and interdependent benefits that society gains from nature' (Carter, Kass, Everard and Scott 2013)

Visioning

In the visioning process, through ES, a focus would look at the; quantity and quality data, as to the extent and conditions of land use change, also taking into account the usage and quantity of natural resources. In *figure 34*, the ES framework would provide structure and comparability for the scenario visioning. In variable cases of design, it may be useful for sub-categories to be added accordingly.

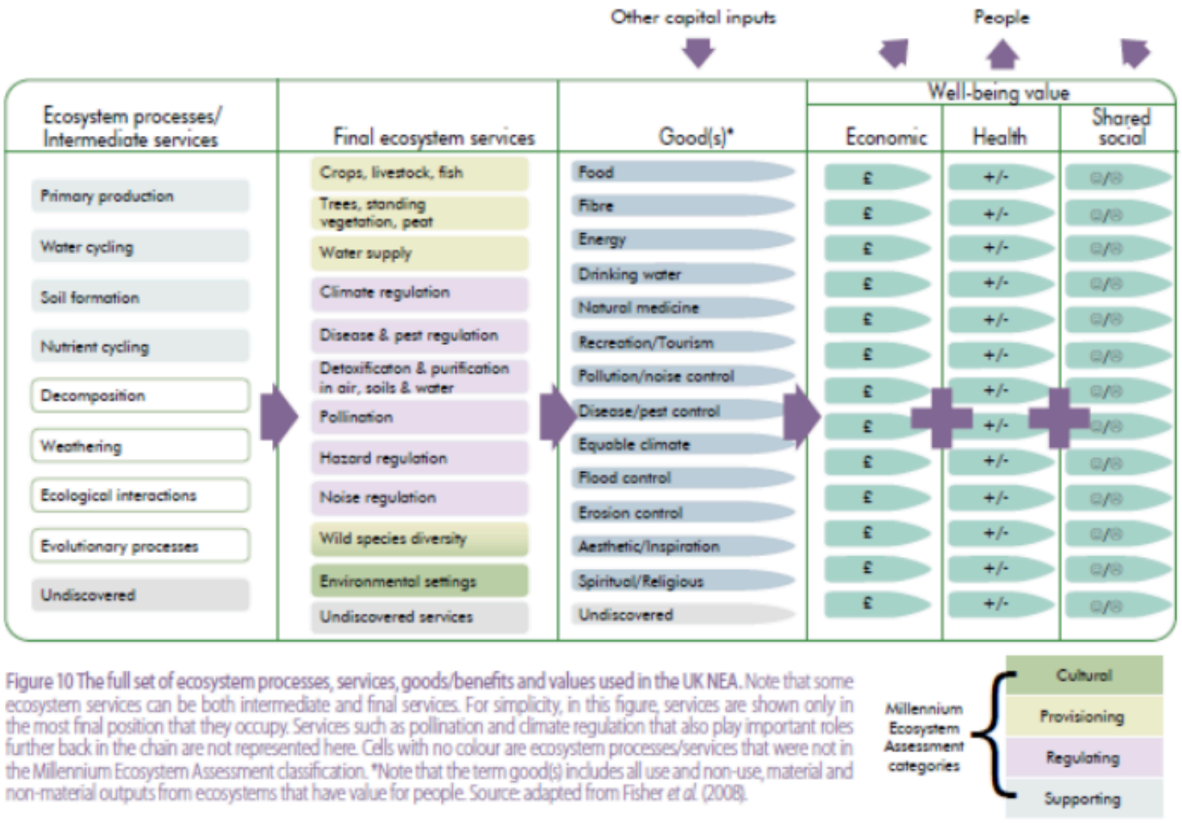

Figure 10 The full set of ecosystem processes, services, goods/benefits and values used in the UK NEA. Note that some ecosystem services can be both intermediate and final services. For simplicity, in this figure, services are shown only in the most final position that they occupy. Services such as pollination and climate regulation that also play important roles further back in the chain are not represented here. Cells with no colour are ecosystem processes/services that were not in the Millennium Ecosystem Assessment classification. *Note that the term good(s) includes all use and non-use, material and non-material outputs from ecosystems that have value for people. Source: adapted from Fisher *et al.* (2008).

Figure 40:The Ecosystems Services Framework as used in UK National Ecosystem Assessment Source: (UK NEA 2011, Table 10, and p.15: Carter, Kass, Everard and Scott (2013)

Interestingly, the approach of futures visioning identifies what can be done now and includes a sequence of events to achieve long term goals. This practical guide echoes Permaculture's design principles, to 'make small and slow solutions and design from patterns to details.' This is done by assessing and highlighting the relationships between ecosystems, beneficiaries and interdependencies. The result of this scenario-based process, to project scoping, creates sustainable management and helps timeframe scenarios, while limiting uncertainties by identifying hazards to the environmental, economic and social domains.

The researcher would like to make clear that through the process of reviewing models of evaluation which can create a 'common language' between Permaculture and the mainstream industries, the ES framework provides a tested template for adaptation. Un-adapted it would seem that the fit between the two relevant, yet different sets of principles, is not perfect and would require discretion from ecological designers looking to incorporate ES visioning and evaluation tools into Permaculture design processing.

Communication Models for Collaboration

A common theme made apparent through the ethnographic approach relates to how groups communicate and organize to create an effective impact. Models of communication are needed to assimilate groups and allow for collaboration based on meta similarities of value and approaches. Effective strategies of communication and models of communication are needed to integrate groups and allow for co-operation based upon meta similarities in method and of values, as opposed to micro differences and localised agendas etc.

Cross cultural discourse merits an entire study in its own right, specifically addressing sustainable development agendas and permaculture discourses. Within the context of this research it was noted how effective communication between stakeholders was of upmost importance for achieving shared actionable goals.

Throughout the study, the method of 'Clean Language ', as a tool for preparation and feedback, yielded results in time management and mapping outcomes, along with personal state management and illumination of the resources required. Interestingly, when trialling the method in team meetings, the questions stimulated clarity and understanding of stakeholder needs. 'Systemic Modelling' uses a core technique in achieving this' (Walker 2014);

1.Clean set up.

2.Clean feedback.

The recordings of these sessions provide a 'person centred approach' to team cohesion, allowing each individual the opportunity to absorb each other's requirements and motives for the tasks at hand and build shared action goals.

Opportunities Going Forward

After the extensive review of literature and observations through the ethnographic lens of permaculture actors, the authors collated suggestions for Permaculture research going forward;

- Cross cultural discourse collaboration tools for communication and effective shared strategies.

- Scientific rigour in the collection data on Permaculture within Agroforestry specifically, Forest Garden potential for climate restoration and food security in a range of biomes (Poffenberger 2006: Crawford 2010)

- Transform productivity and stimulate high quality production and resilience in particular in developing countries (IFOAM 2019: WFO 2019)

- Scientific rigour of Permaculture discourses towards each SDG, for evidence informed policy pathways, by developing systematic documentation for monitoring local projects and how this can be incorporated into the Permaculture design process (Goldring 2014).

Barriers and limitations to Research.

This study is limited by its restriction to English-language literature and ethnographic linguistic observations. Follow-up reviews of Permaculture literature and field observations in multiple languages should be carried out at the earliest opportunity.

Additionally, this study addresses a range of aspects of Permaculture such as applicability for policy making, agroecological transition, linguistics and discourses, and technology. This exploration should therefore not be read as a comprehensive assessment of the breadth of Permaculture literature and tangible impacts.

Due to the vast subject of Permaculture and sustainable development, along with the initial query of the global north and global south stance, there were multiple challenges. The geographical context of the case studies allowed for a limited time in the field observing and data recording. The data recordings were thus taken at specific times of the year, which may or may not have influenced the activities of Permaculture stakeholders, such as the wet and dry seasons of Indonesia. Acknowledging permanent agriculture is observed throughout the seasons, it is important to give voice to the impact the timing has on a project of this scale and complexity.

The mixed roles assumed by the author of 'sustainability practitioner' and, concurrently, 'researcher' provided a challenge. The constant review from different viewpoints bounced between the view of pragmatists (chai, 2002), and what is true, resulting in prolonged periods of time being allocated to address the most accurate way to present the data. This caused the author of ensuring, as accurately as possible, that personal views were legitimate and displayed appropriately. Other barriers became apparent further through the research. It is the conclusion of the author that many barriers would be eased by increasing the volume and scale of the research data sets.

A key point of the research has focused on the cross-cultural barriers and ideologies within, and around, particular discourse groups. The lack of academic rigor, specific to Permaculture's

role in policy making, posed a substantial limitation to the research, resulting in the ethnographic study needing to utilise existing frameworks to bridge Permaculture ideas and evidence practice and outputs with policy decision making approaches and theory.

Fundamentally, this thesis offers an insight into the activity of Permaculture, with its solutions firmly rooted in regenerating environmental and human wellbeing. The thesis suggests how, by integrating with Ecosystem Services, Permaculture can be adopted into the mainstream to have larger global impact. The prolonged and varied documentation of case studies of enterprises and their associated stakeholders, herein, suggest that the research presented in this thesis is pioneering; original in its style and contains discoveries which, ultimately, have yet to be publicized. The strategies of critically reviewing the literature pertaining to the Permaculture movement, to develop an understanding of the historical and current stance of change makers in the global north and the global south, guided the researcher to key individuals within the sector. Furthermore, the interviews with stakeholders provided the ongoing framework to explore, ethnographically, case studies of effective sustainable practice in human settlement and permanent agriculture. Interestingly, what blossomed from the process was a shared need and concern for effective communication strategies, ultimately highlighting a niche framework for effective execution of shared agendas. On this topic, the ecosystem services framework is one such methodology within industry, which could potentially help translate Permaculture design into the mainstream.

Although the research was aimed to avoid bias of opinion of Permaculture, both for and against, the task was met with difficulty. It is possible that this was due to the dual roles conducted by the author, as both 'researcher' and 'practitioner' (Chai 2002). In addition, it was hard to negate support for the movement, when the researcher was witness to the beneficial impacts Permaculture had upon the lives of the individuals and the communities visited. Having said this, the researcher acknowledges that there are flaws within the Permaculture movement. One such issue was highlighted, when discussing resource availability in the global south along with the inequality of land ownership, referred by the Food and Agriculture Organisations of the UN (source, http://www.fao.org/3/CA1465EN/ca1465en.pdf).

Additionally, the early texts on Permaculture suggest a model of solo self-sufficiency, and although this seems appropriate for current landowners, the reality of today's social climate may carry some limitations as to whether it is possible, or practical, for every member of society to have access to land or a homestead, from which they can provide the necessities for sustaining life. Similarly, there are many products and services needed within modern life to maintain society, meaning not every member of society is time equipped, or possesses the resources and health to invest into permanent agriculture. There will always be diversity of occupations, such as medical professions, technicians, physicians, law enforcement and a whole world of other specialists, which are called upon and valid to build successful social systems. Although Permaculture communicates many solutions to attain the fundamental building blocks of life, in terms of food, water, shelter, organising of communities and connectivity with the outside world, it has a tendency to lean towards a 'utopian' mode of thinking. The danger here is an 'all or nothing' outlook can lead to isolation.

The tools, resources and methods are highlighted as being available to meet the objectives and targets of a vast amount of the SDGs and through assimilation and effective approaches to collaboration the solutions are possible. The question is not how do we achieve the SDGs but is there a willingness, an agency to put aside difference of ideology to co-create change, meet global agenda and put the values that both founded the SDGs and Permaculture as priority? Is there a willingness to align to global values of climate change solidarity, yet act through micro localised values, considering the bureaucratic battles therein? Is it time for shared action goals and value sets to be acknowledged to meet the needs of both people and planet?

REFERENCES

Abrahams, J. C., Coupe, S. J., Sañudo-Fontaneda, L. A., & Schmutz, U. (2017). The Brookside Farm Wetland Ecosystem Treatment (WET) System: A Low-Energy Methodology for Sewage Purification, Biomass Production (Yield), Flood Resilience and Biodiversity Enhancement. Sustainability, 9(1), 147.

Akenji, L., Elder, M., Bengtsson, M., Olsen, S. H., & King, P. (2018). Scoring the Sustainable Development Goals: Pathways for Asia and the Pacific

Akhtar, F., Lodhi, S. A., Khan, S. S., & Sarwar, F. (2016). Incorporating Permaculture and strategic management for sustainable ecological resource management. Journal of environmental management, 179, 31-37.

Altieri, M. A., & Koohafkan, P. (2008Enduring farms: climate change, smallholders and) traditional farming communities (Vol. 6). Penang: Third World Network (TWN).

Awlaki & Saqran, Mona. (2019). Microfinance and Entrepreneurship Training

Baldwin, J. R., Faulkner, S. L., & Hecht, M. L. (2006). A moving target: The illusive definition of culture. *Redefining culture: Perspectives across the disciplines*, 3-26.

Bassi, E. (2019, June). European Drones Regulation:Today's Legal Challenges. International Conference on Unmanned Aircraft Systems (ICUAS) (pp.443-450). IEEE.

Borron, S. (2006). Building resilience for an unpredictable future: how organic agriculture can help farmers adapt to climate change. Food and Agriculture Organization of the United Nations, Rome.

Bourmaud, Gaëtan. (2019). For Systemic Approaches to Permaculture: Results and Opportunities for Thinking About Sustainable Development: Volume VIII: Ergonomics and Human Factors in Manufacturing, Agriculture, Building and Construction, Sustainable Development and Mining. 10.1007/978-3-319-96068-5_107.

Brem-Wilson, J. (2015). Towards food sovereignty: interrogating peasant voice in the United Nations Committee on World Food Security. Journal of Peasant Studies, 42(1), 73-95.

Bromley, D. W., & Cernea, M. M. (1989). The management of common property resources. World Bank discussion paper, 57, 1-66.

Bulkeley, H., & Betsill, M. M. (2013). Revisiting the urban politics of climate change Environmental Politics, 22(1), 136-154.

Burgess, J., & Green, J. (2018). YouTube: Online video and participatory culture. John Wiley & Sons.

Burleson, E. (2016). Paris agreement and consensus to address climate challenge.

Campbell, J. E., Lobell, D. B., Genova, R. C., & Field, C. B. (2008). The global potential of Environmental science & technology, 42(15),

Ceballos, G., Ehrlich, P. R., Barnosky, A. D., García, A., Pringle, R. M., & Palmer, T. M. (2015). Accelerated modern human–induced species losses: Entering the sixth mass extinction. Science advances, 1(5), e1400253.

Claudia Carter, Gary Kass, Mark Everard, Alister Scott(2013) -Guidance to incorporating ecosystems services into 'Future Scenario Tools'

Cohen, J. E. (1995). Population growth and earth's human carrying capacity. Science, 269(5222), 341-346.

Collier, P., & Dercon, S. (2014)50 years projection for Africa to aim for better worker efficiency and less small holdings with driving of people into urban environments, whilst increasing farm sizes.

Collier, P., & Dercon, S. (2014). African agriculture in 50 years: smallholders in a rapidly changing world? World development, 63, 92-101.bioenergy on abandoned agriculture lands.

Connors, P., & McDonald, P. (2010). Transitioning communities: community, participation and the transition town movement.Community development journal,(4), 558-572.

Costanza, R., Fioramonti, L., & Kubiszewski, I. (2016). The UN Sustainable Development Goals and the dynamics of well-being. Frontiers in Ecology and the Environment, 14(2), 59-59.

Chia, R. (2002). Philosophy and Research. Essential skills for management research, 1.

Chenhall, R., Senior, K., & Belton, S. (2011). Negotiating human research ethics: Case notes from anthropologists in the field (Respond to this article at http://www. therai. org. uk/at/debate). Anthropology Today, 27(5), 13-17.

Crane A., Viswanathan, L. and Whitelaw, G. (2012) Sustainability through Intervention: A Case Study of Guerrilla Gardening in Kingston Ontario, Local Environment: The International Journal of Justice and Sustainability, 1 – 20.

Darke, E. (1995). Mills A Mill Should Be Build Thereon: An Early History of the Todmorden.

De Oliveira, J. P., Cadman, T., Ma, H. O., Maraseni, T., Koli, A., Jadhav, Y. D., & Prabowo, D. (2013). Governing the forests: an institutional analysis of REDD+ and community forest management in Asia. International Tropical Timber Organization (ITTO)/United Nations University Institute of Advanced Studies (UNU-IAS), Yokohama, Japan.

Denzin, N., and Lincoln 1994 Handbook of qualitive research. Sage Publicatio, California, pp:3-5.

Drever, E. (1995). Using Semi-Structured Interviews in Small-Scale Research. A Teacher's Guide.

Edwards, A. R. (2005). The sustainability revolution: Portrait of a paradigm shift. New Society Publishers.

Erasmus, D. (2019). Saving our medium-sized farms. Farmer’s Weekly, 2019(19004), 4-4. Evans, G. (2018). Com Building a Culture of Care at Black Bulga. Communities, (181), 47-49. 2000

Federico, G (2010). Feeding the world: an economic history of agriculture, 1800- 2000(Vol. 34). Princeton University Press.

Felix-Romero, J. (2010). Harvesting peace: Permaculture as peacebuilding (Doctoral dissertation)

Ferguson, R. S., & Lovell, S. T. (2014). Permaculture for agroecology: design, movement, practice, and worldview. A review. Agronomy for Sustainable Development, 34(2), 251- 274.

Ferguson, R. S., & Lovell, S. T. (2015). Grassroots engagement with transition to sustainability: diversity and modes of participation in the international Permaculture movement. Ecology and Society, 20(4).

Feola, G., & Nunes, R. (2014). Success and failure of grassroots innovations for addressing climate change: The case of the Transition Movement Global Environmental Change, 24, 232-250.

Ferris, S., Robbins, P., Best, R., Seville, D., Buxton, A., Shriver, J., & Wei, E. (2014). Linking smallholder farmers to markets and the implications for extension and advisory services. MEAS Brief, 4(10), 13-14.

Flores, Jabez Joshua. (2018). Designing Food Security: The Applications of Permaculture in Sustainable Agriculture— Case Studies in the Philippines.

Food and Agriculture Organisations of the UN (2019) FAOs' Work on family farming, Preparing for the Decade of Family Farming (2019–2028) to achieve the SDGs. http://www.fao.org/3/CA1465EN/ca1465en.pdf

Forman, R. T (2000). Estimate of the area affected ecologically by the road system in the United states. Conservation biology, 14 (1), 31-35.

Forrest, S., Trell, E. M., & Woltjer, J. (2019). Civil society contributions to local level flood resilience: Before, during and after the 2015 Boxing Day floods in the Upper Calder Valley. Transactions of the Institute of British Geographers, 44(2), 422-436.

Fox, J. (2002) ‘Understanding a dynamic landscape: land use, land cover, and resource tenure in Northeastern Cambodia’, in Walsh, S. and Crews-Meyer, K. (Eds.): Linking People, Place, and Policy: A GIScience Approach, Kluwer Academic Publishers, Boston.

Fox, H. E., Christian, C., Nordby, J. C., Pergams, O. R., Peterson, G. D., & Pyke, C. R.(2006). Perceived barriers to integrating social science and conservation. Conservation Biology, 20(6), 1817-1820.

Gans, D. (2010). Haiti and the Potential of Permaculture. Places Journal

Godfrey, R., & Julien, M. (2005). Urbanisation and health. Clinical Medicine, 5(2), 137- 141.

Gowdy-Wygant, C. (2013). Cultivating victory: The Women's Land Army and the Victory Garden movement. University of Pittsburgh Pre

Gonçalves, F., Fischer, E., & Dirzo, R. (2017). Forest conversion to cattle ranching differentially affects taxonomic and functional groups of Neotropical bats. Biological conservation, 210, 343-348.

Gray, R. (2007). Practical bioregionalism: A philosophy for a sustainable future and a hypothetical transition strategy for Armidale, New South Wales,Futures, 39(7), 790-806

Gregory, K. L. (1983). Native-view paradigms: Multiple cultures and culture conflicts in organizations. Administrative science quarterly 359-376

Halsey, R. J. (2014). Food security and rural education Encyclopedia of Food and Agricultural Ethics , 972-979.

Harden, C. (2010). Amazonian Dark Earhs: Wim Sombroek’s Vision. Vadose Zone Journal, 9(2), 504-505.

Hardman, M., Adams, M., Barker, M., & Beesley, L. (2019). Food for all?: Critically evaluating the role of the Incredible Edible movement in the UK. In Urban gardening and the struggle for social and spatial justice. Manchester University Press.

Harris, D., & Harris, S. (2010). Digital design and computer architecture. Morgan Kaufmann.

Hathaway, M. D. (2016). Agroecology and Permaculture: addressing key ecological problems by rethinking and redesigning agricultural systems. Journal of Environmental Studies and Sciences, 6(2), 239-250.

Haviland, W. A., Prins, H. E. L., McBride, B. and Walrath, D. (2010) Cultural Anthropology: The Human Challenge, Wadsworth: Cenrage Learning.

Hemenway, T. (2015). The Permaculture city: Regenerative design for urban, suburban, and town resilience Chelsea Green Publishing.

Holmgren, D. (2007) Essence of Permaculture. Hepburn: Holmgren Design Services.

Holmgren, D. (2012) Future scenarios: how communities can adapt to peak oil and climate change. Chelsea Green Publishing

Holmgrem, D.(2010) Permaculture Principles & Pathways Beyond Sustainability

Holmgren, D. (2002). Principles & pathways beyond sustainability. Holmgren Design Services, Hepburn.

Hockin-Grant, Kenneth & Yasué, Maï. (2017). The effectiveness of a Permaculture education project in Butula, Kenya. International Journal of Agricultural Sustainability. 1- 13. 10.1080/14735903.2017.1335570.

Hopkins, R. (2010). The Transition Handbook: from oil dependency to local resilience;Manuel de tran

Hoseini, P. S., Poursafa, P., Moattar, F., Amin, M. M., & Rezaei, A. H. (2012). Ability of phytoremediation for absorption of strontium and cesium from soils using Cannabis sativa. International Journal of Environmental Health Engineering, 1(1), 17.

Idham, N. C., Numan, I., & Mohd, M. (2010). CHANGES OF QUALITY IN JAVANESE HOUSES.open house international, 35(3).

IFOAM (2019**)** Full Cost Accounting to Transform Agriculture and Food Systems A guideline for the organic movement, developed in collaboration with the Sustainable Organic

Agriculture Action Network. Retrieved from https://www.ifoam.bio/sites/default/files/tca_paper_final.pdf

IMF. (2014). Regional Economic Outlook: Asia and Pacific - Sustaining the Momentum: Viligance and Reforms.

IPCC (Intergovernmental Panel on Climate Change), 2007a.Climate Change 2007: The Physical Science Basis, Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press.

Jedlicka, W. (2010). Sustainable graphic design: tools, systems and strategies for innovative print design. John Wiley & Sons.

Johnson, R (2009) Food Security: The Role of Agricultural Trade, Washington: International Agricultural and Food Policy Council.

Jorgensen, L. D. (1989) Participant Observation: A Methodology for Human Studies, London: Sage.

Keenan, R. J., Reams, G. A., Achard, F., de Freitas, J. V., Grainger, A., & Lindquist, E. (2015). Dynamics of global forest area: Results from the FAO Global Forest Resources Assessment 2015. Forest Ecology and Management,352, 9-20

Kennedy, D. (1991). Permaculture and the sustainable city. Ekistics, 210-215.

Kim, D. G., & Kirschbaum, M. U. (2015). The effect of land-use change on the net exchange rates of greenhouse gases: A compilation of estimates. Agriculture, Ecosystems & Environment, 208, 114-126.

Kranz, A. J., Wolz, K. J., & Miller, J. R. (2019). Effects of shrub crop interplanting on apple pest ecology in a temperate agroforestry system.Agroforestry Systems, 93(3), 1179-1189.

Kolarevic, B. (Ed.). (2004). Architecture in the digital age: design and manufacturing. Taylor & Francis

Laurance, W. F. (2007). Forest destruction in tropical Asia. Current science, 1544-1550.

Lafferty, W. M., & Eckerberg, K. (Eds.). (2013).21: working towards sustainable development From the Earth Summit to Local Agenda. Routledge.

Lang, T., & Schoen, V. (2016). Food, the UK and the EU: Brexit or Bremain?.

Lawley, J., Meyer, M., Meese, R., Sullivan, W., & Tosey, P. (2010). More than a Balancing

Liebman, M. (1987). Polyculture cropping systems.

Litfin, K. (2009). The global ecovillage movement as a holistic knowledge community. Environmental governance: power and knowledge in a local-global world, 124-42.

Litfin, K. (2012). Reinventing the future: The global ecovillage movement as a holistic knowledge community. In Environmental Governance (pp. 138-156). Routledge.

Lovelock, J., & Lovelock, J. E. (2000). Gaia: A new look at life on earth. Oxford Paperbacks.

Lowenfels, J., & Lewis, W. (2010). Teaming with microbes. Workman Publishing Inquiry: The University of Arkansas Undergraduate Research Journal, 20(1), 7.

Luchkina, C. M. (2016). Online Permaculture Resources: An Evaluation of a selected Sample. Inquiry: The University of Arkansas Undergraduate Research Journal, 20(1), 7.

MacCarty, N., Still, D., Ogle, D., & Drouin, T. (2008). Assessing cook stove performance: field and lab studies of three rocket stoves comparing the open fire and traditional stoves in Tamil Nadu, India on measures of time to cook, fuel use, total emissions, and indoor air pollution. Aprovecho Research Center.

Mars, R. (2005). The basics of Permaculture design. Chelsea Green Publishing.

McKeown, B., & Thomas, D. B. (2013). Q methodology (Vol. 66). Sage publications.

IMF. (2014). Regional Economic Outlook: Asia and Pacific - Sustaining the Momentum: Viligance and Reforms

Magioli, M., Ribeiro, M. C., Ferraz, K. M. P. M. B., & Rodrigues, M. G. (2015). Thresholds in the relationship between functional diversity and patch size for mammals in the B razilian Atlantic Forest. Animal Conservation, 18(6), 499-511.

McIntyre, Beverly D., Hans R. Herren, Judi Wakhungu and Robert T. Watson, eds, 2009.International Assessment of Agricultural Knowledge, Science and Technology for Development: Synthesis Report. Washington, DC: Island Press.

McKenzie, L. and Lemos E. (2018) The Tropical Permaculture Guidebook – International210

Mechler, R., & Bouwer, L. M. (2015). Understanding trends and projections of disaster losses and climate change: is vulnerability the missing link? Climatic Change, 133(1), 23- 35.

Mertz, O., Mbow, C., Reenberg, A., & Diouf, A. (2009). Farmers' perceptions of climatechange and agricultural adaptation strategies in rural Sahel. Environmental Management, 43(5), 804-816.

Meyer, J, Meese ,M. R., Sullivan, W., & Tosey, P. (2010). More than a Balancing Act?Clean Language As an innovative method for exploring work-life balance.

Mkumbo, W. C. (2016). The role of school libraries in realizing the achievement of inclusive and equitable quality education in Tanzania: SDGs by 2030. International Research: Journal of Library and Information Science, 6(2).

Mohan Das Gandhi, N., Selladurai, V., & Santhi, P. (2006). Unsustainable development tosustainable development: a conceptual model. Management of environmental quality:an international journal, 17(6), 654-672.

Mohd Salleh, Anizah & Mastura, Farah & Esa, Norizan & Ibrahim, M. (2018). Permaculture Design: Linking Local Knowledge in Land Use Planning for House Compound. SHS Web of Conferences. 45. 03003. 10.1051/shsconf/20184503003.

Mollison, B. (1988). Permaculture: a designer's manual. Permaculture: a designer's manual.

Mollison, B., & Holmgren, D. (1978). Permaculture. Lesmurdie Progress Association.

Morel, Kevin & Léger, François & Ferguson, Rafter. (2018). Permaculture. 10.1016/B978-0-12-409548-9.10598-6.

Milbourne, P. (2011) Everyday (In)Justices and Ordinary Environmentalisms: Community Gardening in Disadvantaged Urban Neighbourhoods, Local Environment: The International Journal of Justice and Sustainability, 17 (9): 1 – 15.

Miles, M. B., Huberman, A. M., Huberman, M. A., & Huberman, M. (1994). Qualitative data analysis: An expanded sourcebook. sage.

Miller, S. A., Ikeda, D. M., Weinert Jr, E., Chang, K. C., McGinn, J. M., Keliihoomalu, C., & DuPonte, M. W. (2013).

Morgan, K. (2015). Nourishing the city: The rise of the urban food question in the Global North. Urban Studies, 52(8), 1379-1394

Murray Li, Tania. "Practices of assemblage and community forest management." Economy and society 36, no. 2 (2007): 263-293.

Nardin, T. (2002). The moral basis of humanitarian intervention. Ethics & International Affairs, 16(1), 57-70.

Newman, P., Beatley, T., & Boyer, H. (2009). Resilient cities: responding to peak oil and climate change. Island Press.

Novara, A., Gristina, L., Keesstra, S., Pereira, P., & Cerda, A. (2017). Natural Farming: fermented plant juice. Tropical Agriculture and Human Resouces, 2, 1-7 Rewilding as nature-based solution in land management. In EGU General Assembly Conference Abstracts (Vol 19, p. 19011)

Nugroho, I., Pramukanto, F. H., Negara, P. D., Purnomowati, W., & Wulandari, W. (2016). Promoting the Rural Development through the Ecotourism Activities inIndonesia.American Journal of Tourism Management,5(1), 9-18.

Olwedo, M. A., Mworozi, E., Bachou, H., & Orach, C. G. (2008). Factors associated with malnutrition among children in internally displaced person\'s camps, northern Uganda. African health sciences, 8(4), 244-252

Pardini, R., Nichols, E., & Püttker, T. (2017). Biodiversity response to habitat loss and fragmentation.Reference Module In Earth Systems And Environmental Sciences. Encyclopedia of the Anthropocene, 3, 229-239.

Pascoe, B. (2014). Dark emu black seeds: Agriculture or accident?

Paton, D., & Johnston, D. (2017). Disaster resilience: an integrated approach. Charles C Thomas Publisher.

Peeters, B. (2011). Permaculture as alternative agriculture. Kasarinlan: Philippine Journal of Third World Studies, 26(1-2), 422-434

Perkl, R. M. (2016). Geodesigning landscape linkages: Coupling GIS with wildlife corridor design in conservation planning. Landscape and Urban Planning, 156, 44-58.

Permaculture.org.uk/sites/default/files/page/document/report_survey_4-1.pdfhange

Permaculture Online with Geoff Lawton (August 24, 2015) Permculture global (2019) retrieved from, Permaculturegloba l.org/projects

Permaculturenews.org/2007/03/01/greening-the-desert-now-on-youtube/

Poffenberger, M. (2006). People in the forest: community forestry experiences from(6332), eaai9214. Southeast Asia: International Journal of Environment and Sustainable Development, 5(1),

Poffenberger, M., & McGean, B. (1996). Village voices, forest choices. Joint forest management in.

Prihatmaji, Y. P., Kitamori, A., & Komatsu, K. (2010, June). The impact of tongue and gulls connection system for earthquake resistance for Javanese wooden house.In Proceeding of the World Conference on Timber Engineering, Trentino, Italy. p(Vol. 415).

Rehman, M. S. U., Rashid, N., Saif, A., Mahmood, T., & Han, J. I. (2013). Potential of bioenergy production from industrial hemp (Cannabis sativa): Pakistan perspective. Renewable and sustainable energy reviews, 18, 154-164.

Reyes, L. Y. (2018). The Legal Green Rush: New California Agricultural Geographies in Commercial Cannabis Cultivation. California State University, Long Beach.

Rhodes, Christopher. (2015). Permaculture: Regenerative - not merely sustainable. Science Progress. 98. 403-412. 10.3184/003685015X14467291596242.

Ribot, J. (2002). Democratic decentralization of natural resources: institutionalizing popular participation. Washington DC: World Resources Institute.

Rice, S. A. (1929). Contagious bias in the interview: A methodological note American Journal of Sociology, 35 (3), 420-423.

Rothe, Katja. (2014). Permaculture Design: On the Practice of Radical Imagination.communication+1: Afterlives of Systems. 3. 10.7275/R58913S2.

Rubin, H. J., & Rubin, I. S. (2011). Qualitative interviewing: The art of hearing data. Sage.

Sachs, Jeffrey D., 2005. The End of Poverty: Economic Possibilities for Our Time.New York: Penguin.

Sanderson, E. W., Jaiteh, M., Levy, M. A., Redford, K.H., Wannebo, A. V., & Woolmer, G. (2002). The human footprint and the last of the wild: Bioscience, 52(10), 891-904.

Sanderson, E. W., Walston, J., & Robinson, J. G. (2018). From bottleneck to breakthrough: Urbanization andthe future of biodiversity conservation. Bioscience, 68(6), 412-426.

Satterthwaite, D., McGranahan, G., & Tacoli, C. (2010). Urbanization and its implications for food and farming.sciences, 365. philosophical transactions of the royal society B: biological (1554), 2809-2820.

Savory (2017) Grasslands, Livestock & Hope.

Savory (2013) How to green the world's deserts and reverse climate change

Saxena, T., & Tomar, P. (2019). Constitutive Performance Characterization of Diversified Bamboo Material–A Green Technology. Available at SSRN 3358200.

Schandl, H., & West, J. (2010). Resource use and resource efficiency in the Asia-Pacific region. Global Environmental Change, 20(4), 636–647. http://doi.org/10.1016/j.gloenvcha.2010.06.003

Schumann, K., Hauptman, J., & MacDonald, K. (2019, May). Addressing barriers for bamboo. ARCC Conference Repository.

Scollon, R. (1997). Discourse identity, social identity, and confusion in intercultural communication. Intercultural Communication Studies, 6, 1-16.

Scott, R. (2010). A critical review of Permaculture in the United States. Rob Scott-Brief Biographical Introduction.

Seismic vulnerability on structural proportions of traditional Javanses wooden houses (Joglo). Procedia Environmental Sciences, (28, 804-808.

Seto, K. C., & Reenberg, A. (Eds.). (2014) Rethinking global land use in an urban era (Vol.14). MIT Press

Small, R., Yelland, J., Lumley, J., Rice, P. L., Cotronei, V., & Warren, R. (1999). Cross-cultural research: trying to do it better 2. Enhancing data quality Australian and New Zealand Journal of Public Health, 23(4), 390-395

Smith, C. (2015). Permaculture–History and Futures. Foresight International.

Shmelev, I. M. (2015). Beyond the drama triangle: The overcoming self.Psychology.Journal of Higher School of Economics, 12(2), 133-149

Starr, C. G. (1991). A history of the ancient world. Oxford University Press, USA.Donald, B., Gertler, M., Gray, M., & Lobao, L. (2010). Re-regionalizing the food system

Statista (2019) retrieved, from https://www.statista.com/statistics/820158/global-legal-cannabis-market/).

Steinfeld, H., Gerber, P., Wassenaar, T. D., Castel, V., Rosales, M., Rosales, M., & de Haan, C. (2006). Livestock's long shadow: environmental issues and options. Food & Agriculture Org.

Stevens, C., & Kanie, N. (2016). The transformative potential of the sustainable development goals (SDGs).

Streeton, R., Cooke, M., & Campbell, J. (2004). Researching the researchers: using a snowballing technique. Nurse researcher, 12(1), 35-47.

Suh, J. (2014). Towards sustainable agricultural stewardship: Evolution and future directions of the Permaculture concept. Environmental Values, 23(1), 75-98.

Taylor, M., Watts, J., & Bartlett, J. (2019). Climate crisis: 6 million people join latest wave of global protests. The Guardian, 28.

Tauger, M. B. (2010). Agriculture in world history. Routledge

Tengberg, A., Fredholm, S., Eliasson, I., Knez, I., Saltzman, K., & Wetterberg, O. (2012). Cultural ecosystem services provided by landscapes: Assessment of heritage values and identity. Ecosystem Services, 2, 14-26.

Tosun, J., & Leininger, J. (2017). Governing the interlinkages between the sustainable development goals: Approaches to attain policy integration. Global Challenges, 1(9), 1700036.

Turubanova, S., Potapov, P. V., Tyukavina, A., & Hansen, M. C. (2018). Ongoing primary forest loss in Brazil, Democratic Republic of the Congo, and indonesia. Environmental Research Letters. 13(7), 074028.

UKNEA (2019) retrieved from, uknea.unep-wcmc.org/Resources/tabid/82/Default.aspx

UNEP. (2016). Global Environment Outlook GEO-6: Regional Assessment for Asia and thePacific. Nairobi, Kenya: United Nations Environment Programme.

Vishwam Heckert, J. (2014). Planning for Abundance: Permaculture and Radical Transformation. Theory in Action, 7(4).

Veteto, J. R., & Lockyer, J. (2008). Environmental anthropology engaging Permaculture: moving theory and practice toward sustainability. Culture & Agriculture, 30(1-2), 47-58.

Vishwam Heckert, J. (2014). Planning for Abundance: Permaculture and Radical Transformation. Theory in Action, 7(4).

Vorster, H. H. (2002). The emergence of cardiovascular disease during urbanisation of africans. Public Health Nutrition 5(1a), 239-243.

Walker, C. (2014). From contempt to curiosity: Creating the conditions for groups to collaborate using clean language and systemic modelling. Clean Learning.

Walker, C., & Lawley, J.(2015) Clean Interviewing: keeping your stuff out and gathering their stuff in

Walsh, B. A., Nixon, S., Walker, C., & Doyle, N. (2015). Using a clean feedback model to facilitate the learning process. Creative Education, 953-960

Watson, Vanessa. (2016). Locating planning in the New Urban Agenda of the urban sustainable development goal. Planning Theory. 15. 435-448. 10.1177/1473095216660786.

Warhurst, P., & Dobson, J. (2014) Incredible! Plant veg, grow a revolution. Troubador publishing ltd.

Weis, T. (2010). The accelerating biophysical contradictions of industrial capitalist agriculture. Journal of agrarian change, 10(3) 315-341.

Weis, T. (2013). The meat of the Global food crisis. The Journal of Peasant Studies, 40(1), 65-85

Weisberger, J. M. (2013). Rainforest medicine: Preserving indigenous science andn biodiversity in the Upper Amazon. North Atlantic Books.

Weiseman, W., Halsey, D., & Ruddock, B. (2014). Integrated Forest Gardening: The Complete Guide to Polycultures and Plant Guilds in Permaculture Systems. Chelsea Green Publishing.

Wezel, A., & Soldat, V. (2009). A quantitative and qualitative historical analysis of the scientific discipline of agroecology. International Journal of Agricultural Sustainability, 7(1), 3-18.

WFO (2019) Women in Agriculture, retrieved from https://www.wfo-oma.org/wp-content/uploads/2019/05/WFO_Policy_on_Women_in_Agriculture.pdf

WFO (2019) Climate change policy, retrieved from, https://www.wfo-oma.org/wp-content/uploads/2019/04/policy-climatechange-agriculture_1.pdf

Whitefield, P. (2004). Earth care manual: A Permaculture handbook for britain & other temperate climates. Permanent publications.

Wierzbicka, A. (1994). Cultural scripts": A semantic approach to cultural analysis and cross-cultural communication. Pragmatics and language learning, 5, 1-24

Willerslev, R. (2007). Soul hunters: hunting, animism, and personhood among the Siberian Yukaghirs. Univ of California Press.

Wiseman, D. J. (1983). Mesopotamian gardens. Anatolian studies, 33, 137-144.

Woo, L. C. (2017). Ecomimesis: A Sustainable Design Paradigm Ecomimetic Solutions to Ecosystem Homeostatic Imbalances. European Journal of Sustainable Development, 6(4), 255-266.

Zalasiewicz, J., Williams, M., Haywood, A., & Ellis, M. (2011). The Anthropocene: a newepoch of geological time?

Zari, M. P. (2010). Biomimetic design for climate change adaptation and mitigation. Architectural Science Review, 53(2), 172-183.

Zhang, J., Hu, J., Lian, J., Fan, Z., Ouyang, X., & Ye, W. (2016). Seeing the forest from drones: Testing the potential of lightweight drones as a tool for long-term forest monitoring.Biological Conservation, 198, 60-69.

Zohari, D. (1986). The origin and early spread of agriculture in the Old World.InDevelopments in Agricultural and Managed Forest Ecology (vol. 16, pp. 3-20). Elsevier.

Appendix

Ethical approval

1. Participant Invitation Letter

The invitation letter stated the study aims and objectives informing the participant of what to expect and what they are agreeing too by partaking in the study.

2. Participant Consent Form

Includes signatures from participants consenting to their inclusion in the study and recording of their data. This document was required to record the agreement between the participant and the researcher.

Addressing Data Protection

Confidentiality

● The records of this study are to be kept strictly confidential. Research records will be kept in a locked file, and all electronic information will be coded and secured using a password-protected file. [*Audio and video tape recordings made, are only available to researchers involved or participants on request. Recordings may potentially be used for educational purposes.]*

● We did not include any information in this report, which may be published, that would make it possible to identify participants unless we received prior consent from them first. Where there was consent to the participant's identity being disclosed in the material that is published, they were given the opportunity to review and approve any material that is published about them.