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# Mental Health & Resiliency: Designing Participatory Nature Dependent Environments and Collaborative Community Cultures for a Sustainable Future.

Master Research Project

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*Environmental Protection Agency. (2017). Image retrieved from: <http://www.openpractices.net/sustainable-communities/> on July 22, 2017*

*This paper is dedicated to my late sister, Deborah Diane. As my first landscape design business partner and best friend, you gave your beautiful children so much nature magic, sharing your love for this planet, the woods, mountains, gardening, and of course, apricot trees; with every excited exclamation of wonder from the smallest of fronds to the whales in the bay—you led with your heart and fervent belief in the power of nature and community. We miss the gift of you and remember you in the bounty all around us: The blossoms and trunks of limbs filled with the flutter of birds and your spirit flying through  
and on.*

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## 1. Abstract

Sustainable design trends have historically wended down a road that supports the idea of densely populated urban planning as a strategy for mitigating sprawl. Creation of dense urban areas takes aim at reduction of carbon emissions. However, studies show that densely populated areas often come with a panacea of mental health, resiliency and quality of life ails for a community.

The following research explores the possibility of combining densely populated design approaches with ancient community methods that encourage close contact with natural environments. Community planning that also creates day to day contact with nature could be a crucial strategy for both sustaining healthy ecosystems and developing healthy communities. The potential for integrating dependence upon nature within built urban environments, as well as the potential for positive place-making by harvesting nature dependent cultural and social assets in communities and neighborhoods is therefore, a rich area worthy of exploration.

In order to explore these areas, mental health research on the effects of nature on the brain, as well as the three leading determinants of social, environmental and economical well-being, world-wide, were reviewed. Resilient indigenous groups and case studies of the happiest nation, of Norway and two leading environmentally sustainable and resilient countries, Costa Rica, and Cuba were examined. The regional communities practicing sustainable methods near the Santa Fe, New Mexico area, Taos Pueblo and the Greater World Earthship Community, in Taos, as well, were also studied for practical solutions in the mid-range, high desert city of Santa Fe, New Mexico. The findings provide an indicative correlation of increased mental health where

communities experience direct contact and reliance upon nature in their immediate surroundings as well as the experience of interdependency in social connection.

## 2. Introduction

*I look for what needs to be done. After all, that's how the universe designs itself.*  
-Buckminster Fuller

Buckminster Fuller believed that all of nature was executed in perfect design, therefore the model to be mimicked in the design processes of built environments (Buckminster Fuller Institute, 2017). This belief is rooted in the idea that something which has taken billions of years to evolve and adapt to the conditions in which it is dependent, likely has a significant head start on the design process that we are unwise to ignore. A relationship of dependency between human beings and nature provides an ever-rewarding opportunity for reciprocal relating and caregiving which are also lessons for survival and stewardship. Much like the relationship between human beings, the relationship between inhabitants and their environs, is also crucial to the health, well-being and resiliency of both.

There exists a parallel theory in human relating which is the belief that a requirement for healthy relationship development is the act of bonding between the infant and their main caregiver, or attachment theory. Originally introduced to the psychology world by John Bowlby, "Attachment theory is a concept in developmental psychology that concerns the importance of "attachment" in regards to personal development. Specifically, it makes the claim that the ability for an individual to form an emotional and physical "attachment" to another person gives a sense of stability and security necessary to take risks, branch out, and grow and develop as a personality." (Psychologist World, 2017)

Further explanations show the correlation between healthy relationship development and the ability to nurture the next generation as a result of effective attachment modeling and bonding in infancy. There are criticisms of the theory, “One of the most common criticisms of attachment theory is that non-Western societies tend to offer up compelling counter-examples. For instance, in Papua New Guinea or Uganda, the idea of a child being intimately attached to a caregiver is somewhat alien, and child-rearing duties are more evenly distributed among a broader group of people. Still, “well-adjusted” members of society are produced, indicating that, at least in these societies, some other mechanism is acting in the place of the attachments that are so necessary for Western children” (Psychologist World, 2017)

While the reference to “other mechanisms,” is likely the community as a whole, and a broader distribution of caregiving responsibilities, what if one of the “mechanism...acting in the place of the (human) attachment,” is that of a relationship developed with nature? To be more specific, an understood and learned dependency on nature? Of relevant note in the quotation above, is that children raised in Papua New Guinea or Uganda, given the open spaces and lack of development prevalence in these countries, are likely to experience a greater amount of exposure to nature and a critical dependence upon the immediate environs surrounding them. The idea of the individual’s need to bond with nature, not only to provide healthier mental health and resiliency capabilities in their lives, yet also, to care for nature itself, poses a question that is of significance to the perceived importance of sustainable practices in society, or the Biophilia Hypothesis (Peter H. Kahn, 1997). This hypothesis does not seek to negate the need for human bonding, it merely suggests that if bonding is critical in developing a healthy relationship

between human beings, then bonding is equally critical in developing a healthy relationship between human beings and nature. The key aspect of bonding in both is the relationship of dependence.

If Fuller's theory is correct, and nature is executed in perfect design, the benefits and characteristics shared by individuals who have early contact with nature and are dependent upon the environment surrounding them, e.g. raised in built environments and communities with the raw materials, water and food harvested from that same nature, should be evident and measurable. Childhood observations in rural areas of farmers throughout the Midwest, later as a young adult in remote areas of Costa Rica, living with indigenous groups throughout Guatemala and Peru provide a lens that focuses upon resilience through nature and community. Furthermore, best practices of such principles are found locally, in the indigenous community of Taos Pueblo, in New Mexico and the Earthship subdivision of Taos; A Better World Community, both of which suggest that these earlier witnessed influences are significant.

The purpose of this paper is to document the potential correlations between early contact with nature, learned dependence upon nature, sustainably built environments and an individual's mental health, resiliency and resulting engagement in environmental stewardship and collaborative community building. Additionally, the research will serve to explore the potential for using this data in the design of participatory sustainable communities: building materials, built environments and agro-urban planning.

## **2.1 Statement of Problem: Why is this important?**

There is a plethora of reasons why the understanding of the correlation between design and behavior is important considering the emergent problems associated with unsustainable human behaviors. Population is increasing while resources and biodiversity are decreasing at alarming rates. Science points toward the need for denser pockets of population and protection of the open spaces and resources remaining, as an urban planning strategy for mitigating resource usage and carbon emissions (Environmental Protection Agency, 2017). If the exposure to nature is critical for the development of a healthy relationship to nature, there exists a challenge in the construction of urban centers that lack accessibility to nature contact, and an early, learned dependence upon ecosystems.

The mental health system is overwhelmed with a growing and seemingly insatiable need for mental health counseling and psychoeducational groups as a response to rampant addiction and lack of resiliency skills. Prison systems and jails world-wide are overrun with individuals who are repeatedly caught up in the inability-to-cope-loops with everyday life and the expectations of society. There lies within the history of the human race, common sense solutions for the resulting psychological detachment to the needs of the environment in individuals and therefore, an increased opportunity of increasing mental health awareness, resiliency and environmental stewardship engagement. A normalization of recognition of dependence upon the planet's ecosystems, and environmental stewardship engagement are key aspects that will need to change significantly in worldwide culture if climate change solutions are to be effectively implemented. Ultimately, the costs of these services and apathy to act, fall upon the

community, tax payers, and the ecosystems for which we owe our very breath. Sadly, the potential of human capital lost as a result of behaviors that indicate a psychological detachment from these natural system floats in the abyss of an unknown equation.

## **2.2 Methodological Approach and Findings**

A comparative, qualitative and quantitative study of case studies of countries and communities that meet the criteria for the topic of this paper will be examined in support of the claim. The mental health, resiliency and environmental stewardship qualities of the case studies and populations studied will be evidenced through the measurable methods of governmental reports on mental health, resiliency indicators, and environmental resource management.

Findings reveal that dependence upon nature alone is not sufficient to increase mental health. Community and social connection are equally important in the role of improving mental health and resiliency, as are culturally adaptive responses to changes in environment.

## **2.3 Application of Findings**

If urban planners and communities create planning for sustainably designed, built environments with ease of access to nature and incorporate the requirement of dependence and need for early contact with the immediately surrounding environment in the design of communities, the costs associated with mental health maintenance will be reduced and a next generation of environmental stewards will be created. Applying these findings in practical ways to small areas, or neighborhoods throughout urban centers will empower communities to create their own best, sustainability solutions in partnership with each other; a strategic approach that

would be further strengthened through policy that incentivizes innovation and community connection in this regard.

## **2.4 Outline**

Contained within the following text, the theory, method, international case studies and regional case studies, analysis, and finally, a synthesized summary of the findings, recommendations, and potential applications as well as challenges will be presented.

## **3. Research Objectives**

*When we look for the source of a love for other life-forms in our genetic inheritance we are searching our past for the authority to act on that love.*

*–The Biophilia Hypothesis*

The controlled and blind research that would be required in order to fully explore this arena is not a feasible prospect for the purpose of this paper, leaving the focus upon the human experience: Both heuristic and qualitative. Fortunately, there is a great deal of information and research that has been conducted in the mental health arenas and the effect of nature on mental health, providing the foundation for solid hypothetical meanderings about the quantitative data that is available in the research of this paper. Relying heavily upon the “authority to act on that love,” of nature, the research objectives contained within is therefore,

- 1) To Explore the effects of early exposure to nature and/or interactive relationship with nature, sustainable practices in building & urban design on mental health, resiliency, and well-being: Historically and within humanities more recent timeline.
- 2) To determine the Potential for increasing mental health, resiliency and the fostering of intergenerational, sustainable practices in populations through the use of

interwoven dependency upon nature in building & design, reduction of urban stressors, and the harvesting of intrinsic cultural assets of land, place and people.

#### **4. Literature Review**

*For desired conclusions, we ask ourselves, "Can I believe this?", but for unpalatable conclusions we ask, "Must I believe this?"*  
— Thomas Gilovich, *How We Know What Isn't So: The Fallibility of Human Reason in Everyday Life*

Understanding human behavior is critical in the quest for sustainable design as a cultural norm in built environments and lifestyles. Much like biodiversity requires a diverse and complex network of links and systems, the need for the human species as it relates to this biodiverse network is equally complex and layered. Given the prevailing practices of construction and urban planning in the last century and resistance toward stewardship perpetuated by a removed environment in habitat, the inquiries therefore, worth exploring, are found in, 1) literature and case studies addressing the major influences of environment found on human behavior, 2) sustainably built environment's effect on wellbeing, resiliency, human behavior in fostering stewardship and, 3) the built environment itself, as a conduit in facilitating the acceptance of sustainability as a norm in construction and regional planning.

The intersection of childhood development and physical health is a widely accepted area of study as are the beneficial effects of green design on health. An area that is less reviewed, which will be the topic of discussion in the following Master Research Project, is that of the effects of early childhood nature contact in a cultural context and the effects of community culture in sustainably built environments and the causal effect on societal behavior and health.

The following areas of research will serve to support the theory that human nature and human's need for close contact and dependence upon nature in a collaborative and community focused manner require consideration in the goal of normalizing sustainable behaviors and stewardship. Further included in the following areas, are qualitative and quantitative research findings from case studies and expert publications in the fields of human behavior, education, sustainability, conservation, built environment, urban planning design and development.

### **Biophilia Place Attachment, and Attachment Theory**

Biophilia, place attachment, and attachment theory play an invaluable role in the development of relationship to environment as well as mental health wellbeing in the human species and therefore, set a formative precedent for integrating this understanding as the motivating foundation of vital priority—indeed an essential human need, in the field of environmental and urban planning design and development.

Biophilia, a term made popular by entomologist and Harvard Professor, Edward Wilson, is best defined as the innate desire that humans possess to connect and experience meaningful ties to nature. Reflecting upon the theory, Wilson wrote in his book entitled, "Biophilia,"

*It is time to invent moral reasoning of a new and more powerful kind, to look to the very roots of motivation and understand why, in what circumstances and on which occasions we cherish and protect life.... We are human in good part because of the particular way we affiliate with other organisms....they offer the challenge and freedom innately sought. To the extent that each person can feel like a naturalist, the old excitement of the untrammelled world will be regained. I offer this as a formula of reenchantment to invigorate poetry and myth...."* (Arts Envirolink, 2000)

In 2016, PBS featured an award-winning documentary about the power of place and place attachment in an extraordinary story titled the "Babushkas of Chernobyl." The true story of

grandmothers who returned to their homeland, though forbidden, due to the still high radioactivity levels, have survived all odds, living well beyond the age of their peers in residence outside of the danger zone. Despite the health risks of eating from the contaminated land and surroundings of medically hazardous radioactivity levels on a day to day basis, these grandmothers fiercely hold on to their homeland, giving thanks to the land, through which they survive, and seemingly thrive (The Babushkas, 2016).

In this story and others examples to be reviewed in this paper, the root cause of resiliency and evidence of longevity, point in the direction of early childhood bonding with environment as well as a deep, irrevocable sense of belonging—also contributors to better mental health.

Place attachment is a theory that is paralleled in many ways to the foundations of Attachment Theory and provides insight into the interrelatedness of cause and effect, and the interpersonal process of connecting in human interaction. The theory, originally founded by John Bowlby, is detailed by the author, Bretherton, a research assistant from 1971-1973 for Dr. Mary Ainsworth, the preeminent partner of Bowlby in the development of the attachment theory. In *The Origins of Attachment Theory*, she states,

*One of the major tenets of security theory is that infants and young children need to develop a secure dependence on parents before launching out into unfamiliar situations.” Referencing Salter, Bowlby’s wife, Bretherton goes further to describe, “In her dissertation, entitled “An Evaluation of Adjustment Based Upon the Concept of Security,” Mary Salter (1940) states it this way: Familial security in the early stages is of a dependent type and forms a basis from which the individual*

*can work out gradually, forming new skills and interests in other fields. Where familial security is lacking, the individual is handicapped by the lack of what might be called a secure base italics added from which to work. (p. 45)” (Altman, 1992).*

It is understood that many of these associations and links are difficult to accurately measure given the subjective nature of the themes and bias of self-reporting. Vaske Williams seeks to create a method of validity measurement in the area of place attachment using psychometric approaches (Williams, 2003).



*Figure 1*

The premise that secure attachment is born from the development of a consistent and reliable, dependent relationship with another human being is often used in clinical assessments as a measure of one’s ability to develop a healthy and interdependent relationship as an adult. Therefore, the same principle and theory might be applied in the measurement of

one’s ability to create a relationship to nature, using the models of secure attachment requirements; the first of which being first person and consistent contact with nature as well as the maintenance of dependence—or interdependence.

In the writings of *The Human Relationship with Nature: Development and Culture*, the book reveals that much of the argument of a human being’s need for connection and relationship with environment is again, found in Wilson’s theory of biophilia. Author, Peter Kahn, through his extensive case studies on populations throughout the United States, the Amazon, and Portugal,

further supports the idea that all human beings seek to connect to life and all living things as a result of encoded evolutionary survival messaging (1999).

### **Built Environment Design, Use of Natural Materials, Nature Contact & Effect on Mental Health and Child Development**

James Dyck, a LEED certified architect and Montessori Teacher Trainer specializing in Education outlines in his article on the built environment, the effect of environment on learning through the Montessori lens (Dyck, 2002).

*Dr. Anne Taylor is an educator who is a strong supporter of the importance of the built environment and of Montessori education. She suggests the following: ...human infants and children learn more rapidly in stimulating and varied physical environments which meet basic human needs...The architectural settings can facilitate the transmission of cultural values, stimulate or subdue, aid creativity or slow mental perception, and cause fear or joy...There cannot be separation between the learning process and the physical environment – they are integral parts of each other. (Taylor, 1988, p. 23).*

### **Built Environment Design, Nature and Natural Materials Contact Effects on Wellbeing**

In the American Journal of Public Health article, “Healthy Places: Exploring the Evidence,” author, Frumkin, reports on the effects of healthy environments, and the statistics supporting the theory of physical and mental wellbeing as a construct of public health. Frumkin is a professor at the University of Washington School of Public Health and has authored a number of articles and publications on the topic of place attachment, health as these subjects relate to urban planning and community design (University of Washington, 2017).

### **Early Nature Contact; Childhood Development & Stewardship**

In “Natural Curiosity, A Resource for Teachers: Building children’s understanding of the world through environmental inquiry,” Chiarotto, a life-long teacher, lists environment as one of the

most important resources for teaching children and teaching deeper understanding of the interconnected and interdependent relationships in nature (Chiarotto, 2011).

### Effective Methods of Teaching Sustainability

Many countries reflect ideological practices that provide a cultural foundation for intergenerational life patterns. Best practices in the effectiveness of teaching sustainability to the next generation, is

documented in Sutherland’s case study in the Journal of Environmental Education, *Child to Parent Transfer of Environmental Ideology in Costa Rican Families: An Ethnographic Case Study* (2010).

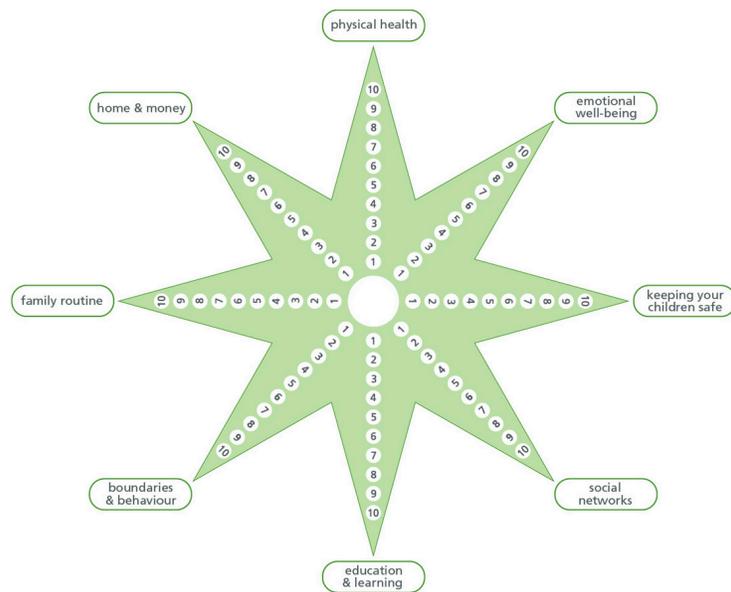
Yet, missing from these cause and effect links to mental health

in environment is the relationship itself to nature, the interdependent relationship that results



Figure 3

when an individual is reliant upon ecosystems in their purer form in order to survive, and the relationship that develops as a result. The star assessment is a common tool for



Family Star™ (2nd Edition) © Triangle Consulting Social Enterprise Ltd  
 Authors: Sara Burns and Joy MacKeith  
[www.outcomesstar.org.uk](http://www.outcomesstar.org.uk)

Figure 2

therapists in western mental health, yet, there is one extremely important relationship missing in the tool which could provide insight into a much deeper realm of the human psyche, that of the individual's relationship with the source of every human beings very creation: The nature and environment we call home.

## **5. Methods and Study Design; Procedures & Data Collection**

A combination of approaches were used for the data collection of the text to follow, beginning with an exploratory method to include Mental health research on the effects of nature on the brain, and the three leading determinants of social, environmental and economical well-being, world-wide, were reviewed. Further methods involving descriptive and correlational as well as review methods were used in the study of resilient indigenous groups and case studies of the happiest nation, of Norway and two leading environmentally sustainable and resilient countries, Costa Rica, and Cuba.

The regional communities practicing sustainable methods near the Santa Fe, New Mexico area, Taos Pueblo and the Greater World Earthship Community, in Taos, as well, were also studied for practical and applicable solutions in the mid-range, high desert city of Santa Fe, New Mexico.

### **5.1 Study Selections: Developing versus Developed, Urban versus Rural, Indigenous Groups, Individuals**

The international study selections mentioned above were chosen for their ranking in the World Happiness Report 2017, as well as their standing in the Sustainable Societies Index for social, economic and environmental well-being. However, the root of the tree, and therefore,

the limbs, that reach for this knowledge in my research began long ago in my observation and personal experiences as a young girl living in the wide open spaces of rural Indiana. This fascination with relationships to nature throughout the world, is a life long journey of wondrous regard for our ability as a species to adapt and practice harmonious living on the one planet we call home.

## **6. Effects of Nature on Mental Health**

*The quiet wisdom of nature does not try to mislead you like the landscape of the city does, with billboards and ads everywhere. It doesn't make you feel like you have to conform to any image. It's just there, and it accepts everyone (Louv, 2005).*

I grew up in small agricultural towns throughout Indiana and Ohio. Though my family did not farm, my father was raised on a farm not far away and he always maintained a vegetable patch in the back yard and many of my relatives and friends were farmers or in the livestock or equestrian business. My childhood was surrounded by large expanses of fields, peppered by barns, the smell of hay, and sounds of babbling brooks, rivers, lakes and wood thickets. These nature scapes comprised my playgrounds, true sense of belonging, and my free education in survival and coping.

Later in life, I entered the United States Army, spending a brief amount of time in Egypt, and Jordan, before being assigned to accompany Special Forces missions throughout Panama and Honduras. The roles in which I was charged frequently required living in a tent in harsh desert locations outside of Cairo, or the damp, densely vegetated jungle settings of Central America. Survival training was par for the course as a soldier in places where one's survival was dependent

upon recognizing venomous snakes, learning to collect water with the tent flap, or how to cool oneself in 120 degree heat in the desert.

A product of the nurturing of nature, my childhood and these trainings came in handy while commercial fishing in the Aleutian islands of Alaska, working as a designer and project manager in the highlands of Guatemala, and remote areas of Peru, or sailing the Caribbean for months at a time while writing about the native culture, ecology and landscape. The last stint of these many years of wandering with my young daughter, also a student of my favorite classrooms due to her mother's inclinations, culminated in the year of 2000. I lived happily ensconced next to the ocean, in the remote southern area of Costa Rica. The Osa Peninsula, my nomadic home, was a yoga and eco tourism retreat center, "Tierra de Milagros." Electricity was generated by solar panels, water was gravity fed from the stream further up the mountain. The walls on the palapa roofed huts were only three and a half feet high; the rest of the jungle was welcomed in to living areas from the waist up. Of course there were some nuisances in this arrangement—ants, snakes and spiders chief among them. Bananas were imprisoned in cages while the monkeys schemed and chattered in their attempts to break them free. It was a delightful setting, where the laws of nature ruled and everyone who lived in the compound was fully aware of the necessities of maintaining the equilibrium within natural law, the dependence upon the water, the sun, the chickens, the garden, the two seasons of hot dry, and warm wet, and the preparations needed for each. We relied heavily upon the wisdom of the locals.

Mental states during these days, surrounded by the constant sounds, vibrational touches upon the senses, provided convincing reminders of the insignificance of our human presence to

the organic cycles of our nature embedded home. Needless to say, the referenced mental states of staff and locals were certainly not always in perfect hum. However, of particular note was the ability that most who lived there, to navigate and rise above any feelings of depression and anxiety, or hopelessness, simply in the course of everyday life and in my professional opinion, as a former Licensed Mental Health Therapist, in the act of healthy relationship scaffolding with natural surroundings and well forged community ties.

There was no avoiding the interdependent relationship with the garden, chickens, horses, the community of stewards in the staff, neighbors and local connections; the dependent relationship upon the giving, often theatrical, vibrantly alive environment of wildlife, flora and fauna through which bare feet walked daily. The pulsing source of seafood, and entertainment ever present in a steady rhythm of waves drummed violently during the rainy season or caressed the shore in lazy grace during the dry season. Its presence always a certainty--demanding our awareness and participation in co-habitation.

Yet, there were those groups that appeared from New York or London, some large metropolis, among whom, would be a number of individuals who did not fare well in the raw environs of the jungle--did not appreciate the interdependent relationship necessary for survival there on the Osa. It struck those of us who resided in the lovely and seemingly idyllic inlet along the Pacific shore that there was something off about those groups—something missing in their understanding of the source of life itself, life cycles and their place in it. In order to assist individuals with their coping, all staff hands were on deck to provide reassurance and support to the frightened and anxiety ridden—their identified enemy--the unknown environs of raw nature.

In *Last Child in the Woods*, author Louv, refers to the one of the founders of the Boy Scouts, Daniel C. Beard, and his books on the experience of youth in nature. “Beard epitomizes a time when a young person’s experience of nature was inseparable from the romantic view of the American frontier...But what really defines these books, and the age they represented, is the unquestioned belief that being in nature was about *doing* something, about direct experience—and about not being a spectator” (Louv, 2005).

The roots of psychology are held in the understanding that the very act of interaction is the foundation of all relationships. I propose that our interactions with nature are much the same. In human relationships, the unknown--stranger, culture or ideology is held in fear and contempt, while the intimate and loved ones, known and cherished, are held close and nurtured, protected and cultivated. It is also not a coincidence that the ills of the planet have followed a parallel trajectory with the detachment from hands on processes in nature. Industrialization and the mechanical overtake of ecosystems are much like the packaged food in the supermarket. The consumer lacks full understanding of the journey the food has traversed to arrive on the shelf. For the sake of “management,” development has veered into a place that leaves the general population equally expectant of the packaged end product, completely unaware of the processes and steps necessary for the water to run from the tap, the warmth to rise from their heaters and the air to chill in refrigerators. As is so often the challenge, lack of awareness leads to misuse of resources and practices that take basic survival needs and the services that mask their relevance in our lives completely for granted.

The observation of visitors and dwellers in the jungle setting, are not unlike similar observations of those growing up in my childhood agricultural environment of eighteen years in Indiana and the highlands of Guatemala, Costa Rica and Peru, where I lived for 4 years, a year and a half, and 8 months, respectively. Research in support of these observed, more resilient coping skills, the healthy relationship to nature--of those who reside in agricultural, or natural settings compared to the coping skills of those individuals coming from an urban setting, are found to be markedly different.

Stanford offers a fascinating study on the effects of a 90-minute walk in nature upon the brain. An indicator of depression and anxiety is the increase in self-rumination. The study, conducted with 38 participants, compared the MRI results as well as the self-rumination of individuals who walked in nature with those who walked along a busy street in Palo Alto,

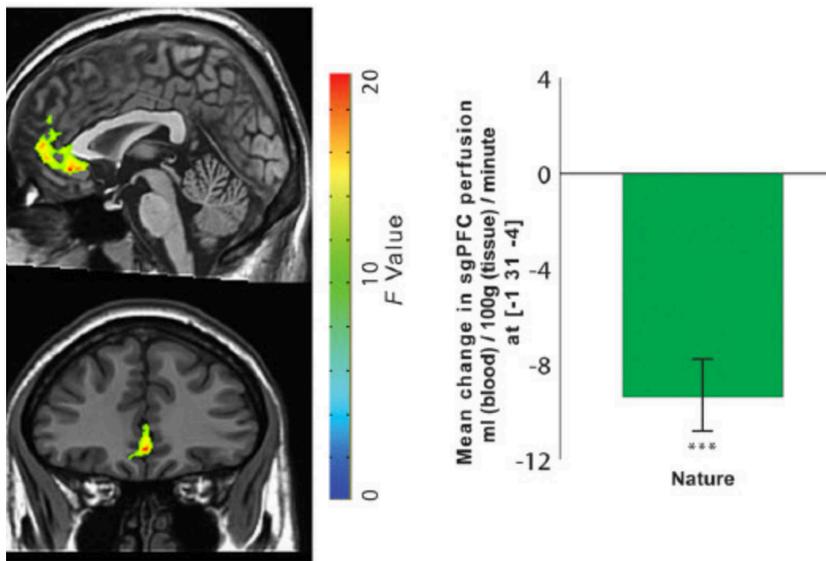


Figure 4

California. Their findings are unsurprising if one is familiar with the soothing balm of nature. A relative and important reference made in the study points toward the effects of landscapes in the Perceived Restorativeness

Scale: “a “soft fascination”; the “sense of belonging”; and the sense of being away.” (Daily, 2015).

*This literature relates to our findings insofar as we may consider these preferred environments to engender the type of positive distraction that has been shown to decrease rumination and negative affect in depressed individuals. Specifically, our findings of decreased sgPFC activity in the nature group point to a possible causal mechanism for the affective benefits of nature experience (Daily, 2015).*

Considering these findings, imagine the benefits of daily interaction with nature, beyond the mere 90 minutes from which the above study of participants MRI's reveal significantly improved brain activity?

Further research by Harvard on the effects upon the brain for workers in green buildings which include unobstructed views to green spaces and fresh, outdoor air versus conventional office settings, support the need for moving built environments toward healthier and more natural settings as well.

*They found that cognitive performance scores for the participants who worked in the green+ environments were, on average, double those of participants who worked in conventional environments; scores for those working in green environments were 61% higher. Measuring nine cognitive function domains, researchers found that the largest improvements occurred in the areas of:*

- *crisis response (97% higher scores in green conditions and 131% higher in green+)*
- *strategy (183% and 288% higher)*
- *information usage (172% and 299% higher) (Harvard, 2015).*

## 7. Indicators of Mental Health: Happiness, Resiliency & Coping

*When despair grows in me  
and I wake in the night at the least sound  
in fear of what my life and my children's lives may be,  
I go and lie down where the wood drake  
rests in his beauty on the water, and the great heron feeds.  
I come into the peace of wild things  
who do not tax their lives with forethought  
of grief. I come into the presence of still water.  
And I feel above me the day-blind stars  
waiting for their light. For a time  
I rest in the grace of the world, and am free.*

*Wendell Berry*

There are a number of indicators that are used in assessing mental health and resiliency. The three common areas of focus for many studies and surveys are found in measuring emotions, cognition and reasoning, as well as social functioning, or how one relates to other individuals, their community, and society as a whole. Well-being scales collect information to measure feelings, “How people feel is not an elusive or an abstract concept, but a significant public health indicator; as significant as rates of smoking, obesity and physical activity” (United Kingdom, 2001). Surveys also measure health, both mental and physical, as well as attitude in the face of adversity, ability to problem solve, crime, addiction, earnings and social behaviors—all of which provide a holistic picture of an individual or community’s mental health and resiliency (Friedli, 2009)

The era in which human beings have entered since the industrial revolution has altered significantly from ancestral, tribal and community ways. Today, society in Western Cultures, especially, is geared toward individualistic and less community oriented goals than the cooperative grouping, and agricultural, interdependent communities of pre-industrial times. Yet, Jacqueline Beam, *Mental Health and Resiliency: Designing Participatory Nature Dependent Environments and Collaborative Community Cultures for a Sustainable Future* 25

the benefits of community living and feeling a part of society, a sense of belonging are key questions to many of the surveys on mental health. In my own past mental health practice, the most important factor in identifying an individual's fragility was in the process of the intake and determining who the individual could count on in case of emergency; it is a well-known understanding in psychology and social work, that the lower the number of persons one can turn to in times of need, the higher the risk for depression, anxiety and suicide.

Observations aside, what does the research say? Are human beings stronger in mental health and resiliency when they are working in collaborative community goals together? In a World Health Organization study on mental health and resiliency, author, Dr. Friedli, refers to the clinical failings of individual diagnosis as "disembodied psychology," and the writings of Christopher and Hickinbottom (2008) which states, "Responses to adversity are strongly patterned by culture, with notable differences between individualistic and collectivist traditions."

The following excerpt from Dr. Friedli's World Health Organization report goes on to support the theory of the benefits of community cohesiveness and material sharing (2009).

*The optimism, self esteem, self efficacy and interest in others that contribute to a child's success at school are also characteristics of resilient neighbourhoods and communities, where norms of trust, tolerance, support, participation and reciprocity may provide some protection from the effects of deprivation. At the same time, there are significant and important caveats: emotional and cognitive advantages are generally trumped by material advantage. Such evidence highlights the importance of moving beyond an exclusive focus on individual mental health status, to identify and understand the context for people's emotional and cognitive responses. Surveys of positive affect, self efficacy, subjective wellbeing or life satisfaction also need to provide a context for considering the potential sources of these attributes and feelings. For example, Alkire has argued that the literature on agency has focused too much on 'own' rather than 'other regarding' agency (Alkire 2007). Others have suggested that an*

*undue emphasis on the individual self reflects cultural bias and a limited world view (Christopher and Hickinbottom 2008).*

Interestingly enough, international data reflects the differences in longevity and morbidity between the haves and the have nots: Those with more wealth live longer and have lower rates of early mortality than those experiencing less wealth (Wilkinson and Pickett 2007). Research in this area shows that it is likely the comparison one goes through in recognizing what they lack than it is the actual lack that causes stress, and therefore, brings about mental health challenges (Friedli, 2009).

How then does this information relate to urban planning, built environments, and the design of communities? Sustainable design encourages smart growth planning, and high density CBD's, yet, many ails are related to living in a highly populated area. The following, taken from my design project for the Lake Jurong District of Singapore speaks directly to this challenge.

*In urban planning and design, the vocabulary tossed about of high density population strategies, blue, green infrastructure, public transportation, readily accessible, (often fabricated) amenities in air conditioned and protected spaces, and packaged foods off the grocery shelf, though useful as challenge identifiers, often serves to numb the language of the heart. The prescription for any disassociation of feeling is to squarely face the culprits of the disassociation. In modern day, this culprit is most commonly known as urban stressors such as noise pollution, air and water pollution, population density, horizon foreshortening, lack of community and disconnection to nature (Beam, 2017).*

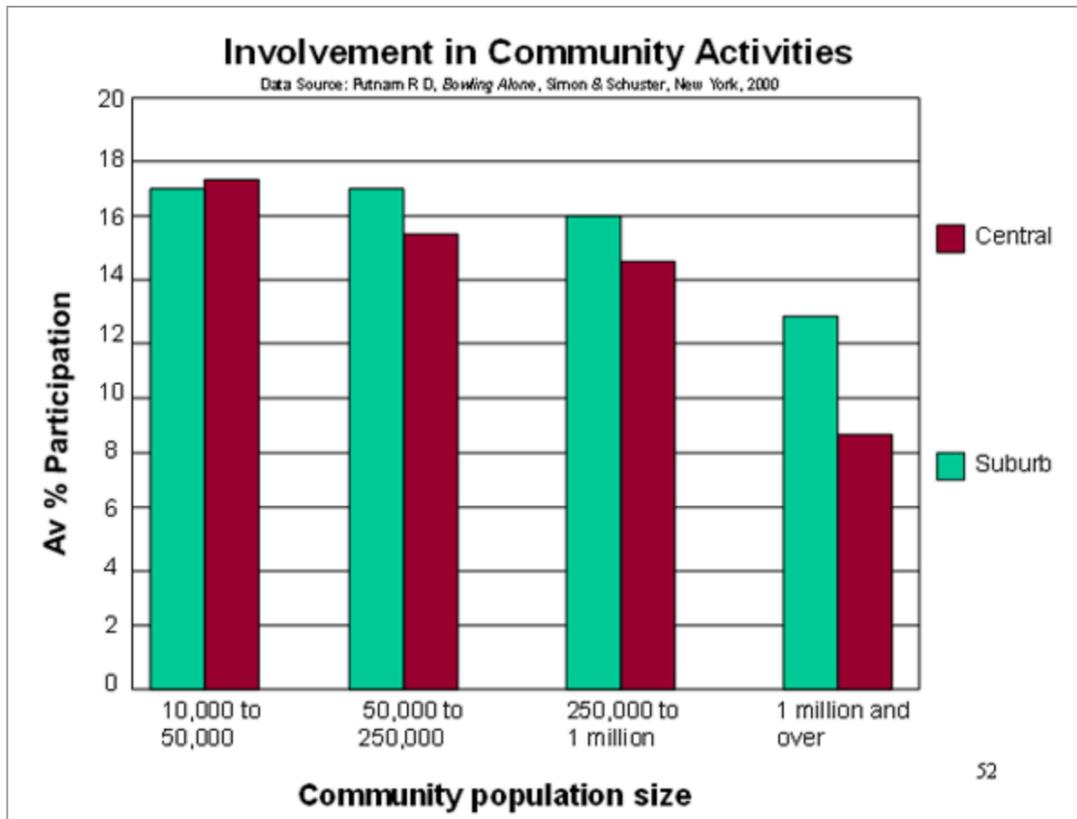
Urban environments are a known risk factor for mental health diseases. Research shows that this is true even when socioeconomics, conditions in infrastructure and access to health and nutrition services are better in comparison to rural regions. The exposure to stress and causal effect of stress vulnerability appears to play the most significant role. Furthermore, it is the

social stress of living in a high density urban setting that increases mental disorder risk the most.

In fact, social stress has even more impact than pollutants of noise or otherwise (Rescei, 2013).

*Living in crowded areas is associated with increased social stress, since the environment becomes less controllable for the individual. Social disparities also become much more prominent in cities and can impose stress on the individual. Further, disturbance of chronobiological rhythms is more frequent in cities than in rural areas and has a negative influence on mental health and beyond. A recent meta-analysis showed that urban dwellers have a 20 per cent higher risk of developing anxiety disorders, and a 40 per cent higher risk of developing mood disorders. For schizophrenia, double the risk has been shown, with a 'dose-response' relationship for urban exposure and disease risk" (LSE Cities, 2017)*

The article goes on to state, that more investigation into research on stress might be the next step in understanding societal solutions. Stress for example, caused by "lack of control, social threat and the fear of losing one's social status...have shown to affect the amygdala and the prefrontal cortex" (LSE Cities, 2017). Yet, the human body is an amazing machine and has built in protections for stress. Proteins released by the body have been shown to improve social behaviors and regulate the brain regions experiencing stress. A key question therefore, in urban planning would be, "what are the ways that brains can be supported to release these essential pro-social neuropeptides and reduce stress caused by densely populated, urban life?" (LSE Cities, 2017)



Adapted from Figure 50, Putnam R D, *Bowling Alone*, Simon & Schuster, New York, 2000

Figure 5

*An association between overall Human Happiness and density. Professor Cummins' Australian Unity Wellbeing Index reports that the happiest electorates have a lower population density. A United States study finds the satisfaction of older adults living in higher density social housing reduces as building height increases and as the number of units increases. By contrast, in lower densities there are higher friendship scores, greater housing satisfaction, and more active participation. This does not apply only to single family houses: Residents of garden apartments have a greater sense of community than residents of high-rise dwellings (Rescei, 2013).*

Considering the above telling graph, the important questions to follow involve inquiry into the ways public and private policies can improve mental health in neighborhoods. The

Commission on Health believes that areas for families and children “deserve special priority,” in this regard (Wood Johnson, 2008).

The World Health Organization, in their report on the topic of improving mental health for populations states that small improvements “in wide levels of wellbeing will reduce the prevalence of mental illness, as well as bringing the benefits associated with positive mental health (Friedli, 2009).”

Listed among the action priorities are conditions that support community and families in “social, cultural and economic conditions,” as well as education, workplaces that prioritize mental health, and partnerships within the community that “address social and economic problems that are a catalyst for psychological distress,” as well as providing a reduction of barriers in policy and environment that prevent social connection (Friedli, 2009).

*While there is much that can be done to improve mental health, doing so will depend less on specific interventions, valuable as these may be, and more on a policy sea change, in which policy makers across all sectors think in terms of ‘mental health impact’. It is already evident that the relentless pursuit of economic growth is not environmentally sustainable. What is now becoming clear is that current economic and fiscal strategies for growth may also be undermining family and community relationships: economic growth at the cost of social recession. This means that at the heart of questions concerning ‘mental health impact’ is the need to protect or recreate opportunities for communities to remain or become connected (Friedli, 2009).*

## **7.1 Wellbeing: World Happiness Report**

*“In a recent speech, the head of the UN Development Program (UNDP) spoke against what she called the “tyranny of GDP”, arguing that what matters is the quality of growth. “Paying more attention to happiness should be part of our efforts to achieve both human and sustainable development” (World Happiness Report, 2017).*

Increasingly, happiness and well-being are becoming the main goals in the development of social progress. The World Happiness Report, using data collection dependent upon self-reporting in response to questions that address GDP, healthy life expectancy, social support, freedom to make life choices, generosity and perception of corruption are used to assess the happiness and well-being of countries worldwide. The first World Happiness Report was conducted in 2012. The unveiling each year, of the report, provides insight into the potential causal links for happiness. Yet, the data is not to be relied upon in a black and white manner given the broad range of cultures and socio-economic factors to be found in the survey responders. Even with the many differences, mental health is considered to play an important role in the reports findings.

*However 80% of the variance of happiness across the world occurs within countries. In richer countries the within-country differences are not mainly explained by income inequality, but by differences in mental health, physical health and personal relationships: the biggest single source of misery is mental illness (see Chapter 5). Income differences matter more in poorer countries, but even their mental illness is a major source of misery (World Happiness Report, 2017).*

Following is the happiness ranking of 155 countries for 2017:

# The world's happiest places

The 2017 World Happiness Report ranks Norway at top, Central African Republic last

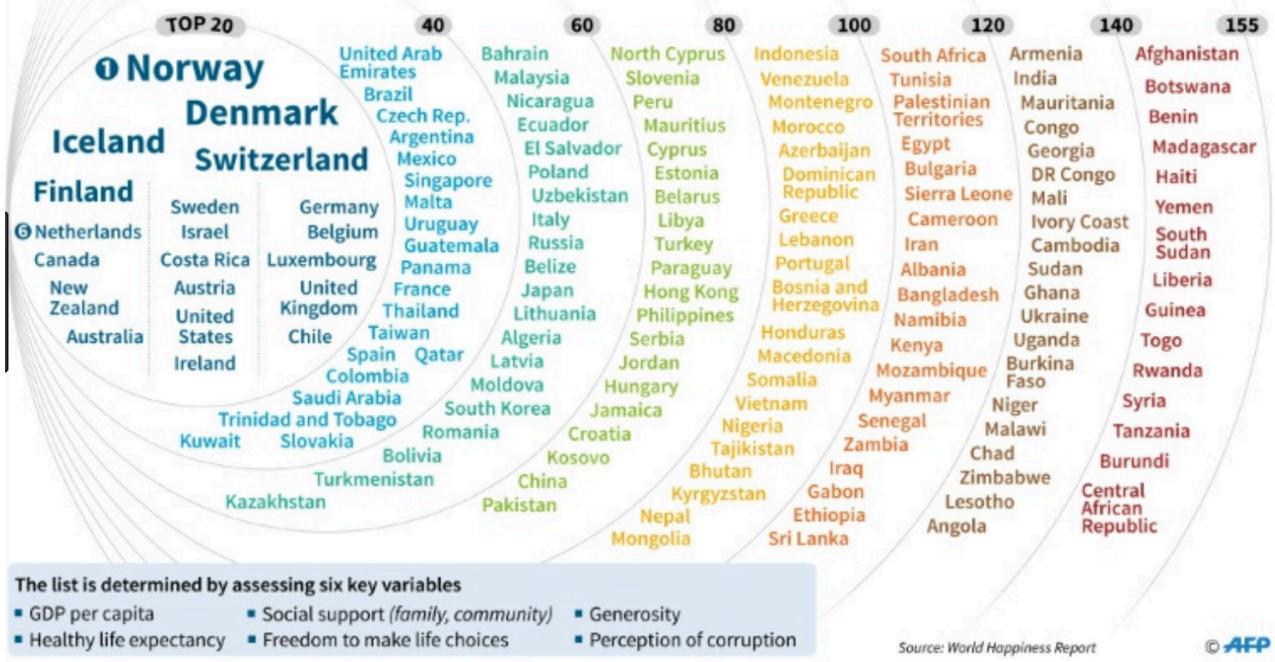


Figure 6

Interestingly enough, and the impetus for the UN Director’s remarks on the subject, those countries with the highest GDP tend to rate their happiness as much higher than countries with lower GDP, two exceptions being that of Costa Rica and Chile.

### 7.1.1 Social Well-being: Top four countries-Finland, Germany, Netherlands, Iceland

Social well-being is a strong indicator of happiness and overall well-being. The map below reveals the countries throughout the world and their ranking in Social well-being, which includes physical and mental health, as reported by the Sustainable Society Index; Green areas reflect the highest ranking while red depicts the lowest in this category. Of note, is that most of the social well-being ranking the highest, are countries who also have a high GDP and are predominantly Caucasian. Areas of Africa reflect the lowest social well-fare which might point toward the effects of war and oppression that slow progress in these areas (World Happiness Report, 2017).

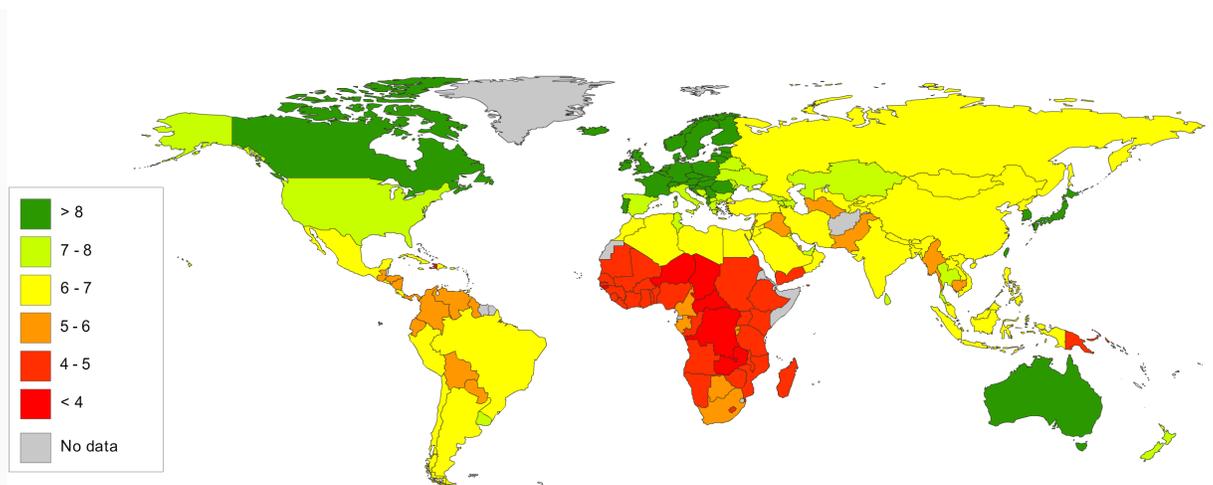


Figure 7

### 7.1.2 Environmental Well-being: Top Four Countries-Burundi, Togo, Lesotho, Central African Republic

*“Although most countries in the world project that life circumstances will improve in future, Africa’s optimism may be exceptional. African people demonstrate ingenuity that makes life bearable even under less than perfect circumstances. Coping with poor infrastructure, as in the case of Ghana used in the chapter, is just one example of the remarkable resilience that African people seem to have perfected. African people are essentially optimistic, especially the youth. This optimism might serve as a self-fulfilling prophecy for the continent in the years ahead” (World Happiness Report, 2017)*

Unfortunately, the countries that score the highest in environmental well-being, are the lowest in GDP and social well-being. Though African nations rank number 1-4 in environmental well-being, they report the lowest satisfaction in both social and economic areas. Yet, as the above quotation reveals, the spirit and ingenuity, as well as optimism of the people from these areas remains extremely high, especially so among the youth. In the future, as climate change and scarcity affects nations throughout the world, qualities such as these will be incredibly important for adaptation and resiliency in an ever-changing environment and the tenuousness of traditional survival methods found in more developed countries.

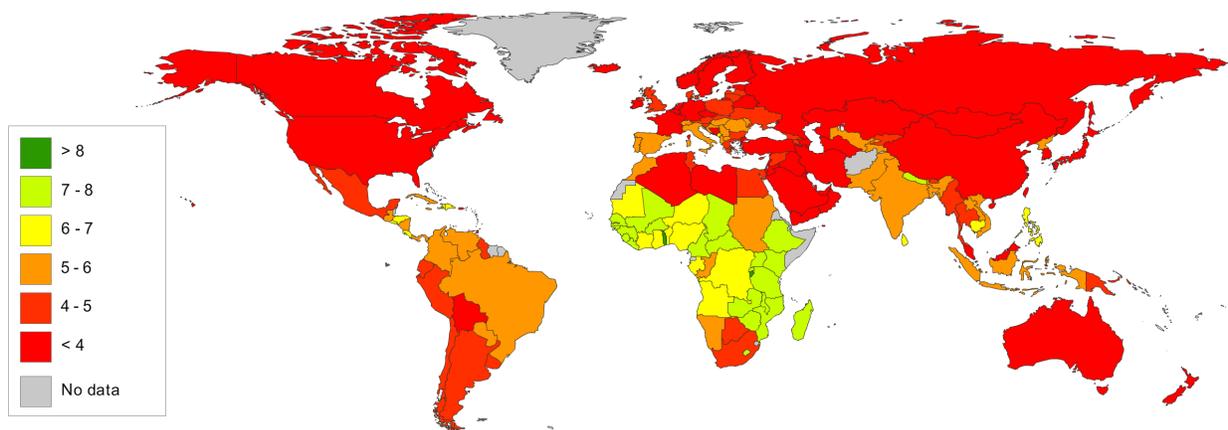


Figure 8

### 7.1.3 Economic Well-being: Top Four Countries-Norway, Switzerland, Estonia, Sweden

The top four countries reflected in the Sustainable Society Index for Economic Well-being are also ranked quite high in social well-being. Reasons for ranking vary, and most of the countries shown in green are highly developed countries with progressive policies and socialized medicine and education. However, sustainable means of income is not indicated. In the case of Norway, the GDP is directly related to the exportation of their primary natural resource, that of oil.

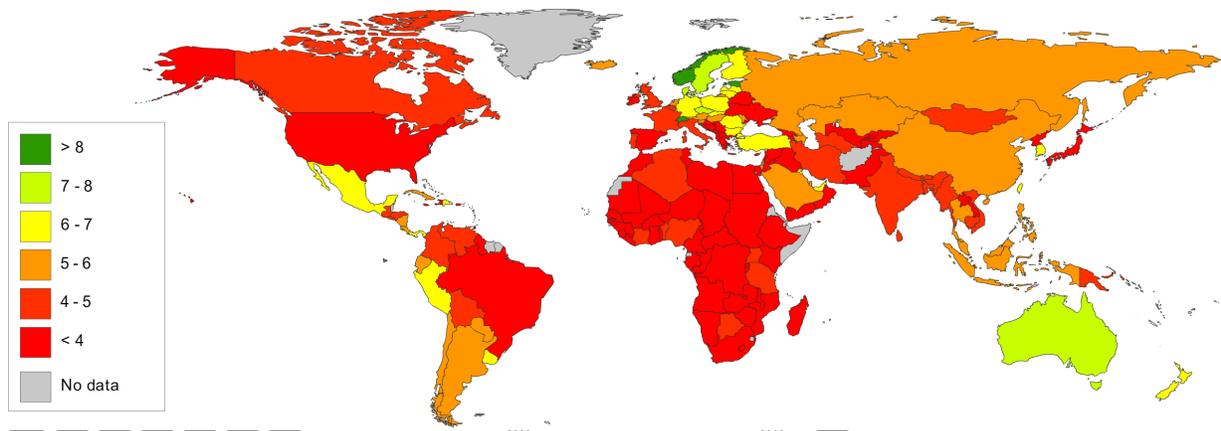


Figure 9

## 7.2 Resiliency

*In order to weave all of the fabrics of place making, the functions and textures of natural ecosystems, as well as manmade features, it is important to recognize the similarities between the earth's methods of cleansing, maintenance, growth, death, and renewal to that of the human body. Much like human organs that have evolved over the course of millions of years to function optimally for the whole body survival as hearts, kidneys, intestines, arteries, and skin, the theory of biophilia purports the earth as a living, breathing system of the same complex and delicately balanced arterial waterways, plant lungs, and soil intestines (Beam, Biophilic Design & Water Magic Place Making, 2017).*

It is important to refer to those groups that have learned how to live with their landscape in harmony with what their immediate environment has to offer if, as previously shown in the environmental well-being of less developed countries in Africa, doing so protects the well-being of the environment. The display of strength in coping and resiliency skills found in these population throughout centuries, provide a map to follow for future populations as they face changes in community definitions as well as resource limitations brought about by climate change.

Two such groups that are relevant to the Santa Fe area, specifically, an area that will be focused upon in the recommendations of this paper, due to its extreme, high desert conditions, are the Dallol of Ethiopia and the Atacamans of Chile.

## Dallol, Ethiopia



Figure 10

*“Afars are nomadic and typically move throughout the region at night, when it's cooler, to gather salt. ...Still, Afars drink cow or goat's milk as their own form of Gatorade. New scientific studies show that certain milks provide the same, or better electrolyte and hydrating solutions as any newfangled sports drink. To adapt to their climate, Afars utilize particular paint colors that reflect the sun.*

*They have even figured unique ways to leverage the high temperatures: they use a composting technique to heat water, which also serves to cleanse water of bacteria” (Excerpt from Earth’s Most Resilient Cultures, Kostigen, 2015).*

## The Atacama Desert, Chile



Figure 11

*Almost unbelievably dry, some areas have not seen precipitation of any kind in more than 400 years, if ever. Yet, there are still dwellings in Atacama. Animals still roam. Plants still survive. People live there. The Atacameno tribe has inhabited this extreme desert since before the Inca Empire and the Spanish colonization. San Pedro de Atacama is the central town village in the area.*

*People who live in the Atacama have even figured out a way to create water out of air: fog nets capture moisture in the air and provide a usable source of water” (Excerpt from Earth’s Most Resilient Cultures, Kostigen, 2015).*

## 7.3 International Case Studies: Happiness, Environmental, Economy Wellbeing & Resiliency Connection

*The United States, because of its geographical location, experiences the most extreme types of weather of any country on the planet. As those extremes become even more so, we will have to learn how to live with changing conditions. Learning from others is a good start” (Kostigen, 2015).*

In the following case studies of Norway, Costa Rica and Cuba, the three countries differ somewhat in not only their GDP and development levels, but their approach to sustainability as well. Yet, one trend in connection is clear—that of GDP, social welfare and happiness. As noted in the undeveloped countries of Africa which rate in the top of the list for environmental wellbeing and the lowest in happiness and economics, environmental wellbeing cannot therefore be considered a sole determinant of happiness, or mental health, wellbeing and resiliency.



Figure 12

F: <http://www.undp.org/content/undp/en/home/sustainable-development-goals.html>

As is indicated in the 17 UN Sustainable Development Goals shown above, and reflected in Maslow’s hierarchy of need, it is imperative that the basic needs of a people are met if a country is to be able to focus upon all of the sustainable development goals put forth and recommended by the United Nations.

Dissection of the “best of” practices in the following three countries provide a template for developed and developing nations to follow and apply in their own practices and policies. Though the case studies are global and address different cultures and areas of the world, there are also, contained within, nuggets of valuable practice models that would be useful if applied to regions and even neighborhoods.

Each country demonstrates different approaches and stages in their development. Whereas, the more developed nation of Norway, with its high happiness score, faces the challenges of sustainable practices in its economy, Costa Rica is challenged with its ability to raise its social welfare scores and GDP. Cuba, on the other hand, while advanced in education and social welfare, with an excellent agricultural model of urban centered operation, struggles with its dependence upon the importation of oil and politically motivated embargos. Yet, the similarities are found in their participatory value system. Engagement and responsibility with and for the environment and each other are paramount in the development of policy and in urban planning for all three countries.

Mental health is affected by a number of influences and there are many indicators of mental health that vary from culture to culture; one common indicator world-wide is that of the state of happiness. The Happiness Report, created by the United Nations seeks to uncover the source of happiness throughout the world by using a scale that calculates a combination of self-reported conditions and individual beliefs, as well as statistical data such as GDP, housing, income and health.

As stated in the OECD explanation of mental states, to summarize, life circumstance carries a large responsibility in an individual's reporting. Therefore, it is difficult to ascertain the validity of the various measurements and scales published on the topic. The following three countries vary in their placement in the happiness index, yet they also vary in their circumstances. Since the Happiness Report finds that GDP and circumstance plays a vital role in the overall happiness an individual experiences, it is important to note that the state of happiness is not necessarily a product of any one factor in an individual's life and practice. For instance, direct contact with nature: While research shows the nature contact effects on brain activity which support a sense of well-being, if one is suffering from illness, hunger, or trauma, though direct nature contact may boost one's sense of well-being, the individual will still report a state of unhappiness due to his or her circumstance.

### 7.3.1 Norway

*Norway moves to the top of the ranking despite weaker oil prices. It is sometimes said that Norway achieves and maintains its high happiness not because of its oil wealth, but in spite of it. By choosing to produce its oil slowly, and investing the proceeds for the future rather than*

*spending them in the present, Norway has insulated itself from the boom and bust cycle of many other resource-rich economies. To do this successfully requires high levels of mutual trust, shared purpose, generosity and good governance, all factors that help to*



Figure 13

*keep Norway and other top countries where they are in the happiness rankings (World Happiness Report, 2017).*

If happiness is an indicator of mental health, it is important to reflect upon the features that make a country “happy.” Norway ranks in the World Happiness Report at number 1 in this regard (Helliwell, 2017).

There is some controversy regarding the fact that with the measurements used by the Sustainable Solutions Development Network of the United Nations in the survey to develop this report, the top countries listed all fall in a majority white populace. It is important therefore, to keep in mind the value system of the survey might be portraying a white value system. However, if one is to review the qualifiers for Norway to rank as number one in this category, it is likely that the emphasis shown in the survey as that of social networking and trust, comprise an important placement in value for all individuals in society, no matter their ethnicity.

Though Norway has always ranked high on this particular index, since the first report in 2012, it jumped to number one from fourth place in 2017. The sudden leap has been attributed largely to the country’s GDP, yet, as noted in the quotation above, oil exports are carefully managed and limited in amounts. Interestingly, the report finds that children in Norway report the least material deprivation of all countries in the world. Yet, Norway ranks 119 on the environmental wellbeing scale (Worldwatch, 2017). Though past efforts have not risen to the top of any environmental stewardship listing, the country has been making a concerted effort to move toward sustainable goals in more recent years creating a formal sustainability plan in 2003. The country is among the highest worldwide in its support and practice of organic farming. Trends reflect decreasing greenhouse gas emissions for Norway throughout the past decade (OECD,

2017). In 2017, the country joined the United Nations in declaring the year for International Sustainable Tourism.

Of important note: The culture of practice in the small nation is that all citizens are responsible for the care of the natural resources and ecosystems of the nation. Yet, in “The Norwegian Model of Sustainable Development,” Dr. Thorvald Moe refers to the lack of valuation for natural capital in historical development within the country (2007). Emphasis in the direction of development for Norway has followed a national wealth pattern, using national wealth as an indicator of sustainability instead (Moe, 2007). More recent efforts to shift toward a system of measuring and valuing ecosystems, rather than relying wholly on GDP indicators is the direction toward which the government has tacked since 2009 (DI, 2016).

Norway, the furthest northern European country, resting along the Baltic Sea, is sparsely populated with a little over 5 million in population (Statistics, 2017). Its high GDP can be attributed to oil exports. As the 8<sup>th</sup> largest exporter of crude oil in the world, it is crucial for the country to shift its vision toward renewable energy and other forms of export in order to adapt to the changing market as climate change requires a new culture of behaviors in energy choices and uses worldwide (DI, 2016).

The dramatic beauty of the Norwegian landscape is undeniable; its wild landscape and its historical dependence upon fishing reflect a cultural value that is held country wide. Norwegians are encouraged to engage in the beauty of their land and explore from an early age. The sustainability plan of the nation places the responsibility of stewardship upon its inhabitants emphasizing the dependency that is shared by all upon the environment (DI, 2016).

### 7.3.2 Costa Rica

*Since 1990, EARTH University's innovative educational approach has been preparing young people from Latin America, the Caribbean and other regions, including Africa and Asia, to contribute to the sustainable development of their*



Figure 14

*countries and construct a prosperous and just society. EARTH offers a rigorous four-year undergraduate program in agricultural sciences and natural resources management and a prestigious, international faculty, providing a world-class scientific and technological education that emphasizes values, ethical entrepreneurship and environmental and social commitment.*

*EARTH was established by Costa Rican law in 1986 as a private, non-profit, international University and was created thanks to the support of the Costa Rican Government, U.S. Agency for International Development (USAID) and the W.K. Kellogg Foundation. (<https://www.earth.ac.cr/en/about-earth/earth-facts/>)*

As number 12 on the Happiness Report (Happiness Report, 2017) and the 26<sup>th</sup> out of 155 countries in ranking on the environmental wellbeing list, (Worldwatch, 2016) and 93.5% powered by renewable energy sources, Costa Rica is an excellent example of adaptability and innovation in its use of cultural and environmental service capital. A lush land of verdant jungles and tropical rain forests, the national mantra, “Pura Vida,” explains a great deal about the culture in two simple words. The country is unique in its history from much of Central and South America in that it was left to its own accord during Spanish Colonization periods. As one of the few countries which did not experience forced labor at the hands of Spanish rule during the

1600-1800's, the small territory has established a history of innovation and investment in education as well as their green economy through incentivizing local communities to care for their regional ecosystems; a government sponsored payment system (Stiftung, 2013).

Costa Rica has also differentiated itself in its refusal to participate in military pursuits or warfare. That is not to say that this small country has always made the best decisions in regard to sustainable practices. In the late 1970's, the health of the land was in great peril. "At the time, forests were being cleared at the rate of 50,000 hectares per year, mostly to enable the production of beef for export to the United States. This represented one of the highest deforestation rates in the world" (Stiftung, 2013).

As a response to the devastation, the government sanctioned parks as protected areas, a move that slowed the deforestation dramatically. Currently, throughout Costa Rica, there are 28 national parks. A total of 27% of the land mass is under governmental protection.

Sutherland's case study in the Journal of Environmental Education, *Child to Parent Transfer of Environmental Ideology in Costa Rican Families: An Ethnographic Case Study* demonstrates that children are not to be relied upon for educating parents in sustainable practices learned in school or elsewhere. The challenge of changing adult behavior requires an incremental educational and application approach in order to be effective (2010).

### **Education & National Investment in Stewardship**

As noted previously, I experienced first hand while living in the Rio Chirripo area as well as the Osa Peninsula, of Costa Rica, the emphasis upon environmental stewardship, and understanding of the local wildlife, flora and fauna as an educational focus amongst the youth.

As a nation that possesses few natural resources in world market demand, the Costa Rican government recognized long before it was popularized, that their biodiversity and tropical Eden-like setting provided the perfect ingredients for ecotourism. Tourism remains one of the main sources of foreign income and an impetus for the educational concentration amongst its youth, the land use incentive policies, as well as designation of protected lands (Stiftung, 2013).

Agricultural Exports are the third highest of all exports for the country pointing toward a direct reliance and dependence upon natural systems in the economy in more areas than just eco-tourism. (Agency, 2017)

### 7.3.3 Cuba

Cuba offers a sustainable development model that is unique in its foundation. As a country that is not only a physical island, but also a political island in many ways, restricted from importing goods and services from the



Figure 15

United States since the 1950's, the government was forced to embed sustainable practices in their policies and resource usage long before sustainability became a popularized term. As a country with a very low GDP, consumption is not emphasized in the culture. Instead, like Costa Rica and Norway, emphasis is placed upon education and health. These two areas are highest on the list of priorities in spending as well as a cultural norm expectation for the Cuban government.

The combination of its human centered focuses has led to a surprisingly high Human Development Index considering their lack of economic strength. Three components comprise the HDI which include quality of life, education, and economics, or GDP. The country's resource usage, due to its non-renewable sourcing from Venezuela has resulted in a rather unimpressive environmental wellbeing score of 49. Yet the country's agricultural practices, as well as their sustainable development has landed an impressive score with the Worldwide Fund for Nature and proven to be an unexpected offshoot benefit of government systems that value human capital and human development (Cabello, 2012).

The Worldwide Fund for Nature uses a measurement of sustainable development through measuring ecological footprint, or the biocapacity use of resources per person, as well as the human development index. According to the WWF, "Cuba is the only country that meets these criteria of SD" (Sustainable Development) (Cabello, 2012).

In analyzing the status of the small country, "An approach to sustainable development: The case of Cuba," some of the reasons cited are the closed means of economics, and the Soviet Union collapse. "Cuba transformed itself into a more self-reliant, less energy-intensive society without abandoning its longstanding commitment to strong health and educational programs" (Wiskind, 2007). It is further emphasized in the case study that the placement of people at the center of development objectives accomplishes a, "linking (of) social justice to environmental protection" (Striker, 2010). Striker goes further to explain that due to the human centered strategy, the potential of individuals is responded to in a qualitative rather than a quantitative manner of approach.

Education is extremely important in the national goals for Cuba's citizens. The government spends more on education than social security, public health, housing and community services, or the military (Cabello, 2012). UNESCO reports that 99.8% of citizens over 15 enjoy literacy and as the age group raises to 24, literacy becomes 100% (2011). It is important to note that with a highly educated population, the added benefit is perhaps that of a larger majority understanding complex systems and cause and effect, the many layers found in sustainable development problem solving and application of sustainable practices.

Self sufficiency in energy as well as food, efficiency in the usage of human capacity, are main factors in measuring the solutions for Sustainable Development. Cabello lists the small ecological footprint of Cuba to be in part due to six factors: 1) A wisely constructed environmental policy that allows for accountability, 2) A strategy of energy use that is appropriate given the island's limited resources, 3) A transformed and resilient agricultural system that is adapted to the urban scale, 4) Restrictions on transportation and fuels, 5) Economical planning, 6) Tradition and culture of careful resource usage (2012).

The very Constitution of the Republic of Cuba sets forth the basic principle of environmental stewardship in Article 27. "The state protects the environment and the natural resources of the country. The close relation between the economic and the social aspects of sustainable development are acknowledged to make human life more rational and ensure the survival, welfare and security of the current and future generations. The relevant institutions should implement these policies. It is the duty of the citizens to contribute to the protection of water, atmosphere, soil, flora and fauna and to the rich potential of the nature" (Leyes, 1997). Cuba's

strategic approach to environmental protection is updated regularly and uses the bio-capacity of areas in order to guide the direction of the living plan.

Though energy consumption is quite low, given the population, what the country is most known for is its success in agriculture. For a long period of time, 1960-1990, agricultural practices were influenced by external technologies from other communist countries. This model failed in the beginning of 1990 when importing resources became too difficult. The resulting effect created challenges with pollution, soil erosion and biodiversity losses, as well as mass farmer migrations to urban centers. “The crisis of the Cuban agriculture resulted in a transformation process that intensifies today. The change has not aimed at environmental conservation or sustainable use of technologies based on scientific approaches, but has been driven by the need to produce food from the natural, materials and human resources available” (Funes Monzote 2008).

The “need to produce food from the natural, materials and human resources available,” is best witnessed in the adaptation of urban agriculture, which has become a way of life with the introduction of “Organipánicos,” or local urban farms that provide the necessities in fruits and vegetables the imported rations are not able to fulfill (Juan Jose Cabello, 2011).

#### **7.4 Commonalities in International Case Studies**

In the three previous international case studies, Norway, Costa Rica and Cuba, the following factors are held in common: 1) participatory cultural value system, 2) accountability and responsibility for the environment and for each other, 3) contact with nature from an early age as emphasized in citizen reliance upon agriculture, fishing, and ecotourism, primary education

and social welfare, and finally, 4) a high volume of natural, scenic beauty in surroundings. In “Urban Design & Mental Health” an online journal on urban planning, beauty in surroundings is not to be underestimated in its effect on mental health. In this British study the findings on surveys of inhabitants in scenic environments provide insight into the potential to be found in the beauty of surroundings.

*Combining this geographic scenic data with census data on people's reports of their own health has led to a remarkable finding: across the entire English dataset, we find that inhabitants of more scenic environments report better health (Seresinhe, Preis & Moat, 2015). Unquestionably, certain neighborhoods may be wealthier, have better access to services or have less air pollution; however these results hold, even after taking such crucial factors into consideration (Chanuki Illushka Seresinhe, 2016)*

Exploring the potential in “beauty of landscape” factors, in a regional and more intimate manner becomes an important step therefore, toward understanding the efficacy of increasing mental health and resiliency through intentionally designed, sustainable, aesthetically pleasing and scenic, participatory communities.

## 7.5 Regional Case Studies

### 7.5.1 Taos Pueblo



Pueblo de Taos © Edmondo Gnerre  
*Figure 16*

The Taos Pueblo is a living community of dwellings that has survived since the 13<sup>th</sup> Century. Situated along the Rio Grande Valley, next to the flowing stream from the Pueblos' sacred Blue Lake and the Rio Grande's abundant tributaries, the adobe structures have been continuously

inhabited for 1,000 years. The Pueblo stands as a symbol for the people of the Pueblo who claim their presence in the Valley from the beginning of time (Unesco, 2017).

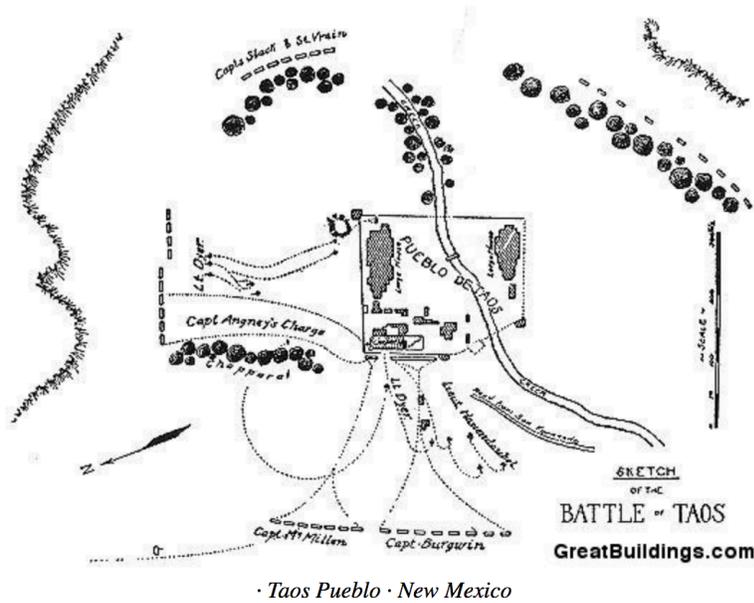


Figure 17

Still inhabited, though now modified, is the Taos Pueblo, Taos, New Mexico, begun before the sixteenth century but showing the traditional method of adobe construction. The pueblo consists of two clusters of houses, each built of sun-dried mud brick, with walls ranging from two feet thick at the bottom to about one foot thick at the top. Each year the walls are still refinished with a new coat of adobe

plaster as part of a village ceremony. The rooms are stepped back so that the roofs of the lower units form terraces for those above. The units at ground level and some of those above are entered by doors that originally were quite small and low; access to the upper units is by ladders through holes in the roof. The living quarters are on the top and outside, while the rooms deep within the structure were used for storage of grain. The roofs are made of cedar logs, their ends protruding through the walls; on the logs are mats of branches on which are laid grasses covered with a thick layer of mud and a finishing coat of adobe plaster. It is a massive system of construction but one well suited to the rigors of the climate... — Leland M. Roth. A Concise History of American Architecture. p6.

The structures within the Pueblo compound, built of natural materials are completely sustainable with electricity and piped water forbidden in the grounds. The cultural heritage of the site is revered by the people who choose to live in the ways of their ancestors, hauling water and relying upon the elements to warm and/or cool their homes and gathering spaces. Though

some European style doors and windows have been added over the years, their addition is limited and do not take away from the primitive, raw nature of the construction.

Agriculture for the pueblo is centered toward the north of the community not far from the banks of Blue Lake. Red Willow Farm is a collaborative of Indigenous farmers who originate from Taos. Embracing the sustainable potential in modern methods and resources, the land is cooperatively farmed with green houses and solar power sprinkling across its fields (Hoover, 2014)

While habits that are linked to poor physical health are more prevalent in the Pueblo, such as overeating, trouble sleeping and lack of energy, mental health in the Pueblo itself, shows less incidence of typical depression and anxiety indicators in comparison to the rest of Taos County and the State of New Mexico, according to City Data in the following graphic.

### Summary

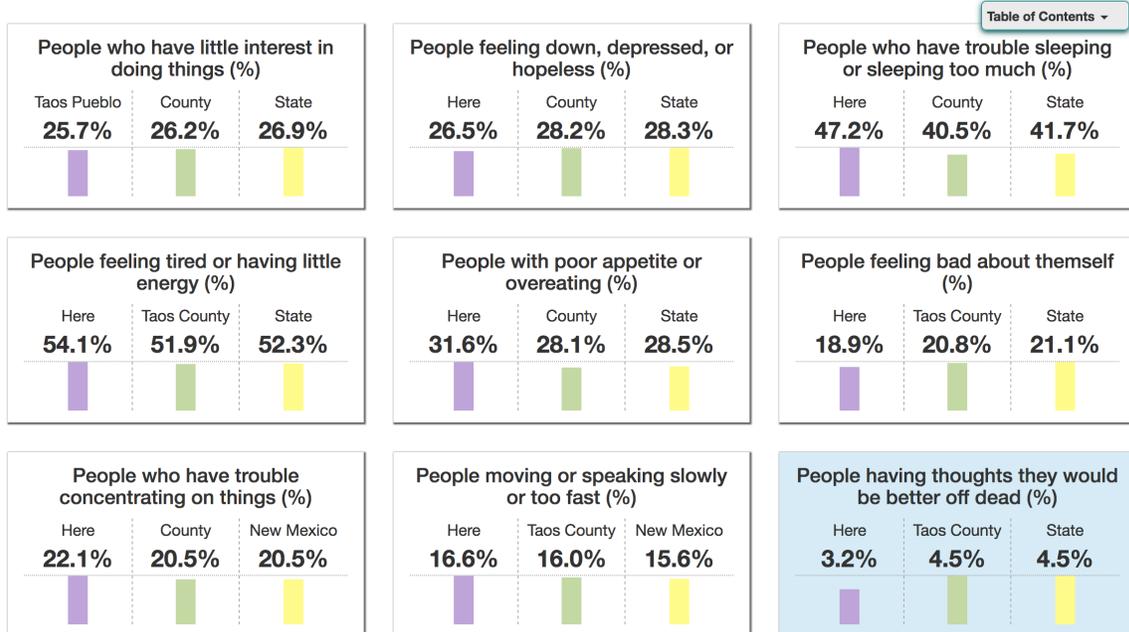


Figure 18

Since this data by City-Data (2017) demonstrates possible correlation between environmental, social well-being and increased mental health and coping, rather than causality, it is impossible to link the mental health of the Pueblo based solely upon this information. Furthermore, given the circumstances of poverty level income and years of oppression experienced by native populations, Taos Pueblo included; it is difficult to ascertain the direct cause of increased resiliency and mental health in this community. However, the residents of Taos Pueblo, in their rich community and cultural connection, required engagement in the ecosystems of their environment and relationship to nature, certainly provide an area for further study that reflects the potential of a controlled study which would provide a deeper understanding of the City-Data’s findings.

### 7.5.2 Earthship Community, Taos

The Greater World Earthship Community also located in Taos, is comprised of buildings made of earth and recycled materials, completely off grid, with built in green houses that serve to provide readily accessible



Figure 17

food, passive solar warmth directed toward the interior walls, and recycling of gray and black water in vegetation growing tanks as well. The rammed earth, semi-earth buried

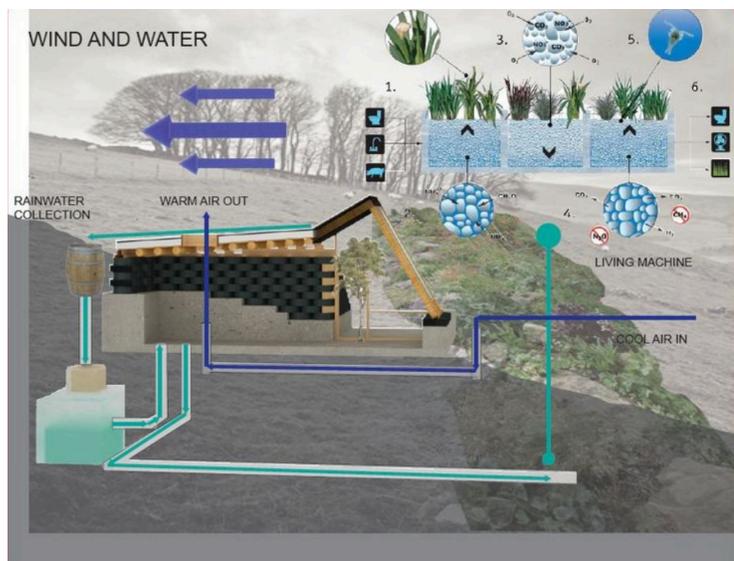


Figure 20

dwelling design is highly self-sufficient, and requires inhabitant engagement and maintenance for meeting most survival needs. A vision of architect Michael Reynolds, beyond LEED, these buildings are representative of the closest, non-indigenous example to the living building challenge one can come (Earthship Biotecture; Design Principles, 2017).

Featured in the Sustainable [Revolution] Project website and book by Juliana Birnbaum & Louis Fox (2014), the community is often criticized for sprawl in its development; the address of which has led to Reynold's re-designation of an area which features several earthships within a close-knit network of structures to serve a denser concentration of population within the 1,338 acre grounds. The evolution of these structures is also found in publications by Earthship Biotecture on the possibilities for retrofitting more conventional homes with the earthship technology as well as ways that this type of construction and concept can be used in urban settings with less moderately dense layouts (Earthship Village Ecologies; Escape From Economy, 2017)

The Global Model shown on the following page is a tried and true product with a lower price point intentioned for accessibility to the masses. According to Reynolds, the Global Model design can be used in any urban setting as well as rural, in any location in the world (Earth Biotecture, 2017).



Inhabitants of earthships are required to monitor the functions of the structure from water collection to energy collection and use on a daily basis. A collaborative community cultural value is relied upon within this community for filling in the gaps when needed through an exchange of goods and services amongst community members.

Though measurement of mental health in the Greater World subdivision is not available in public records or reports, interestingly enough, the small community with only 200 inhabitants, has the lowest crime rate of Taos County according to the Real Estate organization of Trulia (2017). Crime rates are considered to be an indicator of community mental health.

Much like the strategies of Costa Rica in spreading awareness and focusing upon eco tourism and sustainability education, green building tourism and educational workshops have become a major source of income for the Greater World community.

## **8. Study Variables and Comparative Findings: Validity & Analysis**

There are a number of varying aspects to the study data: Cultures and geography, as well as social and economic conditions, chief among the variations. In consideration of the goal to find the “best of” practices for triple bottom line indicators of social, environmental and economic well-being, the researched case studies reveal that nature and a cultural view of the environment in which one lives plays a large part in the development of healthy relationship or attachment to nature.

Brain science, as revealed through the Stanford project, and mental health data cited previously, support the hypothesis that relationships with nature and community are both factors that improve mental health. However, there is little data available on the direct link to

mental health well-being due to reliance upon nature, given the lack of controlled studies on the topic.

### 9. Recommendations: Follow Nature and Community Building in Urban Planning and Built Environments

Considering the indicators of positive mental health, and resiliency as well as the potential of



Figure 22

direct contact with nature and interactive relationships with nature has in increasing mental health and resiliency, it is recommended that built design and urban planning incorporate the requirement for nature interaction

in the planning process as well as retrofitting for increased interaction and dependence (Lejuwaan, 2012).

Common denominators found in Costa Rica and Cuba, highly resilient countries, Norway, a very happy country, are in the natural beauty of the land and intimate relationship with natural systems as well as prioritization of economic investment in education and human capital. As a country, the synthesis of both states, resilience and happiness, are found most in Costa Rica through its culture, practice, and policies that require a recognition of dependence with the laws and abundance of nature and ecosystems in a direct, culturally and economically valued manner. This recognition follows a chain of infrastructure from the national governing bodies to the local

governing bodies—In other words, attachment to nature and an interdependent relationship to nature is part of the very fabric of their culture and value system.

Regionally, much is to be learned from both the Taos Pueblo and The Greater World Community. While it is not feasible to build earth structures in a large-scale way within urban centers, many of the retrofitting strategies found in Reynold's Earthship Biotope plans can be used for reducing energy and water usage while maximizing water harvesting opportunities and closer end-point, agricultural resources. The power of neighborhoods to spontaneously form in bee hive clusters of industry around a green space and collectively strategize for water harvesting, passive solar construction additions, and food sourcing is relatively untapped. This collective formation of resilient and self-sufficient neighborhoods within cities and regions has the potential to change the landscape to that of the tried and true methods, ecological practices of indigenous communities as well as collective rural communities of the past: the idea of which brings to mind barn raising, community harvests and collective water management.

## 9.1 Best Practices: Living Community Challenge-Examples of Place Making and Sustainable Design in Communities

*We had a lot of trouble with western mental health workers who came here immediately after the genocide and we had to ask some of them to leave. They came and their practice did not involve being outside in the sun where you begin to feel better, there was no music or drumming to get your blood flowing again, there was no sense that everyone had taken the day off so that the entire community could come together to try to lift you up and bring you back to joy, there was no acknowledgement of the depression as something invasive and external that could actually be cast out again. Instead they would take people one at a time into these dingy little rooms and have them sit around for an hour or so and talk about bad things that had happened to them. We had to ask them to leave. ~A Rwandan talking to a western writer, Andrew Solomon, about his experience with western mental health and depression (Under the Blue Door, 2014)*

### Kigali, Rwanda

Kigali, Rwanda is an excellent example of community value systems that rely upon nature and togetherness for strength and healing. This new urban development proposal by the University of Arkansas, focuses upon social and economic prosperity. A central corridor for



Figure 23

socializing and commerce honors the long-standing Rwandan culture and traditions of community connection. The placement of agricultural fields surrounding the populace, make essential food sources available for everyone; providing community, health and economy priority

in design (University of Arkansas Community Design Center, 2017). Another University of Arkansas proposal shown below, the use of biodigesters provides a sanitary solution for waste as well as production of energy. Though developed communities rarely need this type of process as a solution, it is certainly an area of exploration for developing nations as well as rural communities (University of Arkansas Community Design Center, 2017).

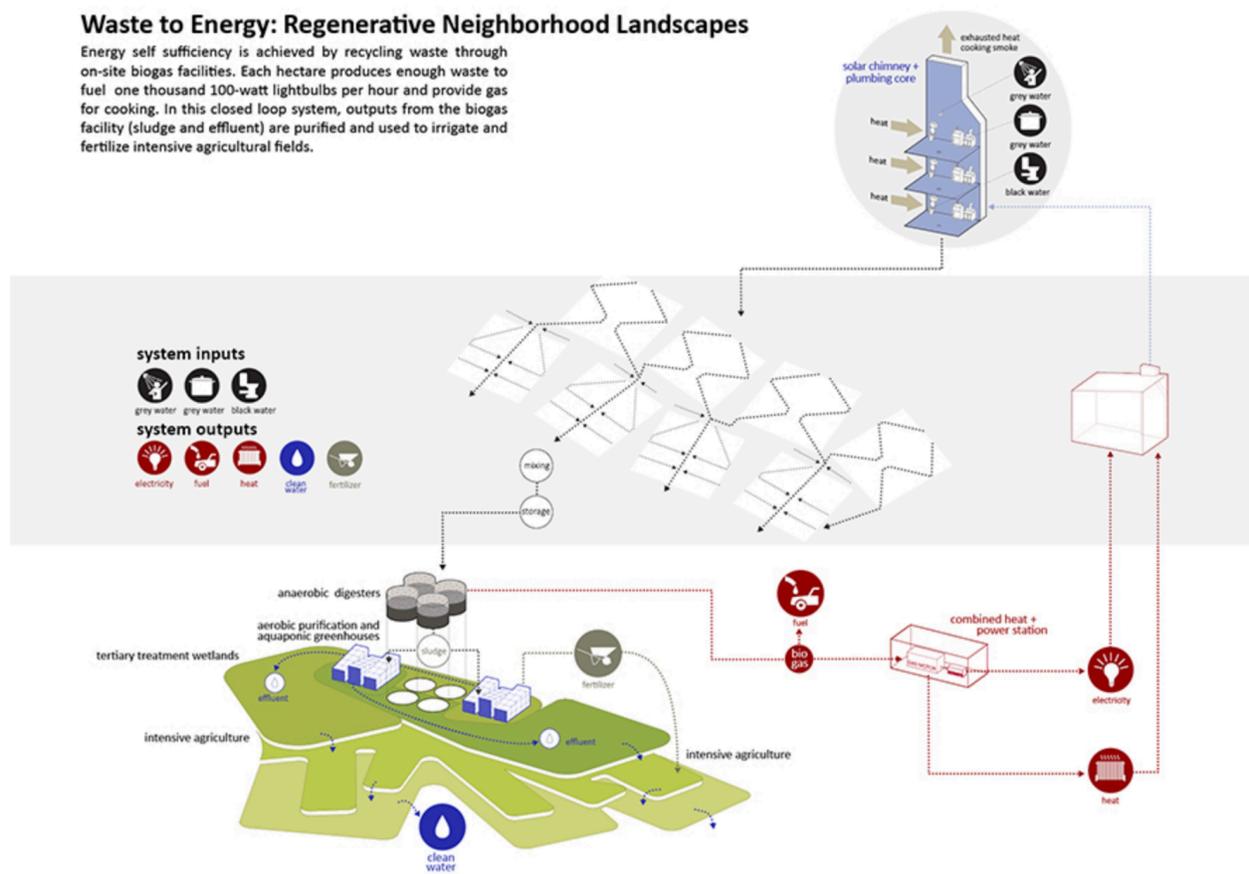


Figure 24

*Nowadays the absence of direct experience has completely misled children's perception of the world and of its most basic processes. This appears particularly true in urban environments where children often ignore, for instance, that milk comes from living animals or that beans don't sprout in cans. Avoiding any old-fogey approach, it's commonly known that children are inherently and intuitively curious naturalists. We believe that this innate quality should be exploited, stimulated and guided through the educational approach of the nursery of the future (aut--aut, 2015).*

The above quotation from the award winning interactive nature nursery design plan by Aut-Aut is a response of habitat for school children, an approach with which Louv, author of *Last Child in the Woods*, would wholeheartedly agree (2005). However, considering the recommendations put forth in this paper, most of the theories supported in the design also apply as strategies to increase mental health and resiliency through interactive nature habitats for adults. The model of Nursery Fields Forever is based upon three main principles: "Learning from nature, learning from technique, and learning from practice" (aut--aut, 2015).



Figure 25

### What defines Sustainable Living?

For each culture and viewpoint, the term is forever shape-shifting.

*'Sustainability' has no single or agreed meaning. 'It takes on meaning within different political ideologies and programmes underpinned by different kinds of knowledge, values and philosophy' (Huckle 1996: 3). A 'weak' view of sustainable development looks to continuing economic growth on terms that favour existing financiers and corporations (while maintaining the support of the majority of voters in countries like the UK). A strong view 'represents a revised form of self-reliant community development which sustains people's livelihoods using appropriate technology' (Huckle 1996: 4). The former would fit in with what we might now describe as the mainstream of politics in many northern countries; the latter represents a greener and more holistic vision. It echoes the concerns of E. F. Schumacher (1973) when he argued for a concern with appropriate scale, wholeness and connectedness (Infed, 2017).*

The Robert Wood Johnson Foundation reports a number of initiatives in the revitalization of neighborhoods which serve to support economic development as well as increase physical and social well-being that provide the “appropriate scale, wholeness and connectedness,” referred to in the article quotation above. The same article goes on to state, “The U.S. Public Health Service Task Force on Community Preventive Services and a team of experts have recognized the large potential health impact of such initiatives” (Robert Wood Johnson Foundation, 2008).

In light of this recognition, some of the most important steps the commission recommends are

- Engaging the community to organize, collectively working with each other to make improvements
- Following the principles of “environmental justice” in interventions by ridding health hazards as well as ensuring services are provided equally in all locations throughout a city.
- Socially, approaches are encouraged which address residential segregation and work to eliminate the lines that keep communities separated.
- And the expansion of accessible housing in areas that offer employment and top quality schools (Robert Wood Johnson Foundation, 2008).

The Aut-Aut Nursery Plan shown on the following page provides in its design for children’s learning experience, a number of the recommended neighborhood features listed in the Commission on Health, that can be applied to neighborhoods, as well as the essential interaction with nature in day-to-day activities—the practice of interdependent nature and human relationships in action

(Anzilotti, 2016).



Figure 26



Figure 27

The development style of urban areas and communities since the industrial age and especially so, since the 1950's, has moved toward the suburban model, a segregated commercial and living

design that often requires long commutes to reach a job location, or shop at a grocery store.

Prior to this time period, communities were designed in clusters or “barrios,” closer in proximity to the day to day needs of life and community gathering spaces as well as economy of commerce which were all integrated within the community layout. Returning to these concepts is possible with small segments of areas in an urban setting transforming into a neighborhood, or pocket neighborhood. Transforming sprawl into pocket neighborhoods would provide the community connection needed in the often experienced disconnection to place that those who live in the suburbs feel.

### **9.1.1 Ways to create Early Exposure to Nature and/or Dependency upon Nature in Existing Urban Settings.**

Keeping in mind the pocket neighborhood concept, cities can identify areas within the city limit boundaries that might be amenable to retrofitting for sustainability and the clustering, integrated strategies of mixed use neighborhoods. Small steps should be incorporated within a neighborhood as well, in order to create daily contact with ecosystems and deeper understanding of the many ways nature provides for the survival needs of a population. Water management is a major concern in densely populated areas. Some of the following simple techniques incorporated into the landscape with educational signage would provide a more intimate contact with these systems, and therefore, the stage for interdependent relationship.

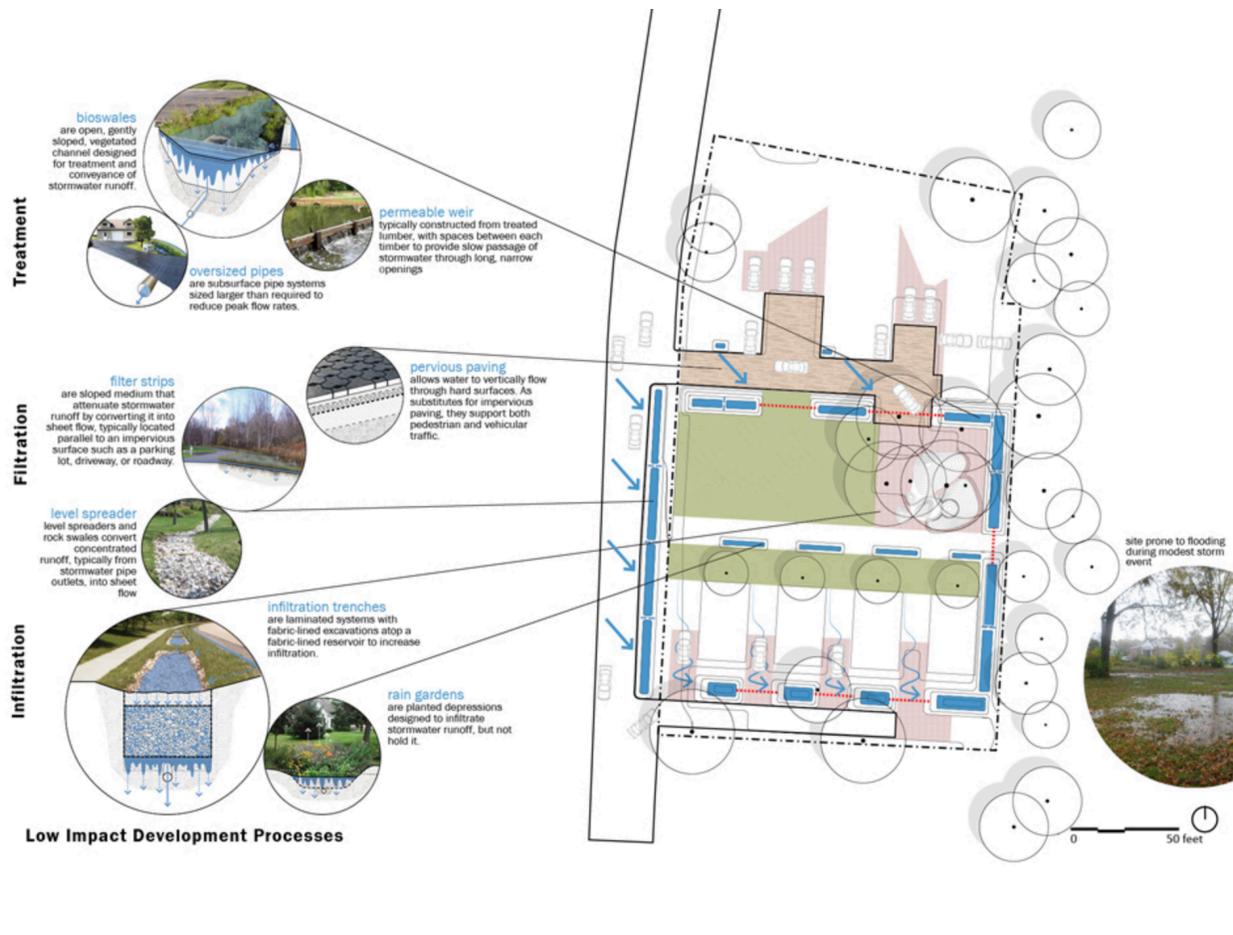


Figure 28

Given the difficulty and expense, not to mention loss of historical relevance, in razing a location to create a “sustainable” habitat or community, a logical next step would be to ask yet another question: What would adapting a concept like the retrofitting, cultural asset harvesting approach revealed throughout this paper look like in a specific location? A prime area to consider for this experiment is in the high desert of Santa Fe, New Mexico. Due to its long-standing history of value for the vernacular structure as well as rich cultural context in water management and agriculture, Santa Fe presents an exceptional stage for the application of this paper’s hypothesis in real time.

### **9.1.2 Cultural Context: Santa Fe, New Mexico—Water, Agriculture, the Pueblo & The Plaza**

*Ditch irrigation had been used in the arid regions of Spain, as well as by Indians of the Southwest. When the Spanish colonists came, they brought both the engineering knowledge and a body of irrigation law necessary to build and regulate water systems throughout the province of New Mexico. For more than 300 years these acequia systems have operated effectively. In rural areas and many towns they are still maintained and cherished. (The Historic Santa Fe Foundation, 2017)*

The city of Santa Fe, in the state of New Mexico is a well known, and popular tourist attraction located in a high desert area within the north central region of the state. The urban landscape the vistas provide now were originally inhabited by a number of agricultural Native American groups and eventually taken over by Spanish settlers in 1607. As in many such settlements, the central feature and draw for the indigenous pueblos and the establishments to follow, was the bounty provided by the Santa Fe River in fish and nearby, fertile, spring irrigated agricultural lands. The main Santa Fe river, a tributary of the Rio Grande, sourcing from the Sangre de Cristo Mountain water shed, is considered to be perennial. However, historically, it is believed that the river flowed year round, albeit the flow was reduced to a stream during the drier season in the months of September through November. There also exists a vast network of arroyos that provide seasonal drainage and undeveloped areas of nature for the residents to walk and explore.

Unfortunately, though the City is formed along the river, the majority of residents of Santa Fe do not remember the time when the river flowed aplenty through the landscape. Due to an increase in in population as well as the reservoir created to control its flow, in the higher elevations of the Sangre de Cristo, the riverbed is dry for most of the year and has been

perennial since 1984 when the walls of the dam in the mountains were raised. For over a decade efforts have been under way in the city to restore the river flow to that of its past through the “Living River” project headed up by the Watershed Association of Santa Fe. In order to examine the efficacy of this vision it is important to address the challenges of river restoration in high desert areas. The historical context of Santa Fe, conservation, urban wildlife corridors and public park systems, as well as the long-term impact of the river’s maintenance through community stewardship and educational programs. Understanding the ecological fabric and cultural attitudes of the region provide the narrative of land and people required for guiding development.

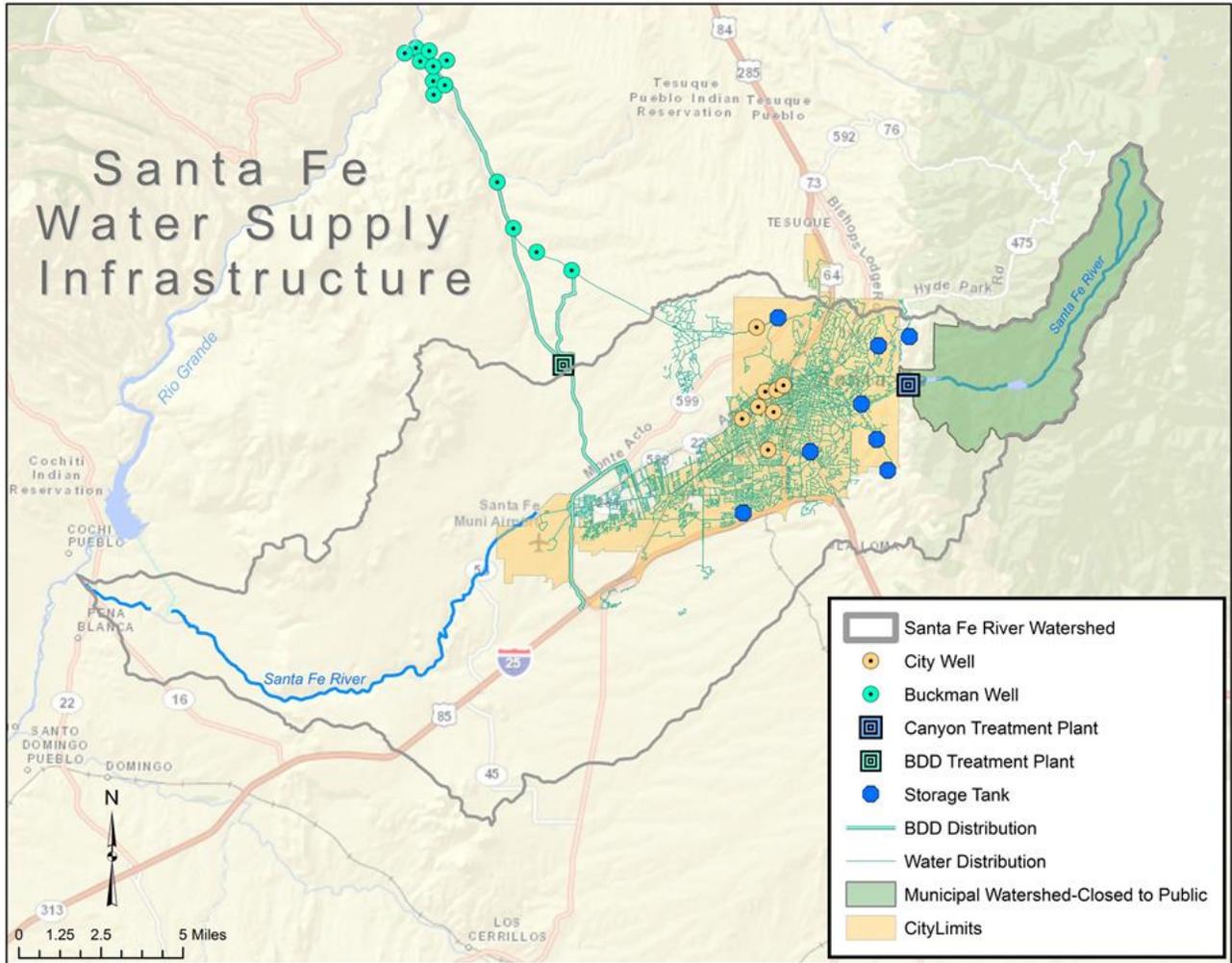


Figure 29

The Santa Fe region ranges in temperature from 20-96 degrees and infrequently goes below or over this range. The coldest months are typically from November through March and snow precipitation is heavily relied upon for the city's water usage during this time. Annual precipitation averages are a little over 14" while snowfall is 22". The "monsoon season" begins in July, runs through August, and is typified by dramatic dumps of rain from stormy, lightening and thunder-laden clouds. It is a period of time that is greatly welcomed by thirsty residents and vegetation alike as it follows a long period of dryness with very little precipitation from April

through June. The humidity is quite low year round ranging from 10-55%. Only three months are considered comfortable, in terms of dew point humidity. The population is close to 68,000.

Though much favored by the community, there are many challenges to be found in the restoration of a river in a desert region—especially so when the region has a history of agricultural use dating back thousands of years. In modern day management, the competition for its usage is daunting. The Living River project is an effort to bring life back to the city in the recognition that by doing so wildlife habitats will be reintroduced and the story of the city and the river will be more than a distant memory. The energetic vibrancy running water provides to the landscape of an area will be enjoyed by locals as well as tourists visiting the area, not to mention the educational opportunities such a project presents. Unfortunately, the project is hampered by the water usage needs of the population.

In 2012, it was determined by the city that periodic flows would be permitted of “1000 acre feet of water...on wet or normal years.” The periodic flows, though not the constant ideal, allow the riparian vegetation and wildlife to take a foothold and survive while the city works on further water conservation efforts for fully restoring the river.

Much more is needed in the way of individual rainwater harvesting and gray water recycling in order to preserve and increase flows.

### **Historical Context, Policy and Conservation**

The fertile soil of the Santa Fe area has supported farming in a manner that seems counterintuitive considering the arid, harsh climate. Yet, the indigenous groups living in this valley successfully used dry farming techniques as well as methods of irrigation through the

channeling of water from the river, and mountains; a technique that was further engineered by the Spanish through the construction of acequias. The Tesuque Pueblo, one of the original Native American establishments just north of Santa Fe, is well known, for its dry farming skills and enduring agricultural expertise. Farmers along the river have water rights usage of the acequias dating back 400 years. Yet, cattle farming has destroyed many of the prior existing woodlands and the majority of acequias are no longer in existence or use, excepting the “acequia madre” or the mother acequia.

In the distant past Santa Fe was a Ponderosa forest. However, conservation practices call for the protection of waterways and nature, in current context, not only how they existed and functioned in the past. Through the examination of the timeline changes in the region’s ecosystem, the landscape no longer supports the needs of a Ponderosa forest. History reveals that the Santa Fe River flourished in the early 1900’s despite the growing population and agricultural usages along its banks. Yet, water levels have not been those required by the Ponderosa for centuries. Restoration goals dating more than 100 years are not feasible. However, it does seem logical that in an attempt to restore the river, policy is needed to address the increased usage in order to mitigate further loss. Therefore, how much more water could be returned to the river if water usage was further restricted and grey water collection were a requirement for residents of the city? It is estimated that individual daily use is approximately 52.4 gallons per capita. The local architecture features flat rooftops in honor of the historical building tradition of the area. Rain harvesting is an accepted practice. With annual snowfall of 22” and rain of 14”, these scenarios offer a great deal in the way of potential additions to the

flow in the collection of rainfall and snowmelt, thereby supporting vegetation and habitat.

### **Urban River Wildlife Corridors and Parks**

Though the river is yet to flow year round, the flow increase approval of 2012 has resulted in a number of wildlife species and riparian vegetation's return to the river banks. The goals for the Living River project—to reintroduce vegetation and restore life to the Santa Fe River—appears to be working. The moisture provided by the minimal, periodic releases are reported to be enough to aid in the beginning processes of restoration. The University of New Mexico is actively involved in monitoring the sites along the river stream from Santa Fe to La Cienega further south. A list of plants that have been reintroduced as well as those which have returned naturally is found in the UNM monitoring report (Elizabeth Milford, 2006).

In the more populated areas along the Santa Fe, permeable paved bike trails were introduced in 2013 that now extend to a stretch of ten miles. Rock waterfalls have been constructed to slow the path of water when it is running, in order to recharge the aquifers more effectively and invasive species are removed when they are identified. A very protected, yet accessible section of the river close to downtown Santa Fe, is managed by the Land Conservancy. The park is much more abundant in wildlife and the flows are higher in this area due to source proximity. With the restoration in process, the corridor for wildlife is growing. Yet, the potential for what is fully possible is evident in the section of river managed by the Conservancy. Replicating the Conservancy model would again, require the addition of flow and more frequent releases throughout the city. The wildlife and vegetation to be found in the downtown area are a good start for what is hopefully to come as evidenced in the increased flows of the Canyon

Preserve.



Figure 30

## Community Culture of Stewardship

The city, in creating a park system that details the history of the Spanish and Native American trading trail along what is now, the Santa Fe River bike trail, has also created an avenue for

residents and visitors to learn about the story of the region. Those who enjoy the park system, as well as businesses and organizations, contribute in the maintenance of the waterway through an adoption program for the maintenance of sections making up the ten-mile trail. The trail is an excellent location for the acequias that were removed over the course of the last hundred years, to be reintroduced as well. The Agua Fria Village, at the end of the ten-mile stretch, is a quaint adobe settlement that boasts a rich history in farming the flat lands adjacent to the river. An addition of informative signs, an educational tour of the reintroduced active acequias and surrounding farmland would provide more opportunities for tourists to visit the southern most reaches of the city; an economically depressed area that would benefit from green economic ventures. It is an area that could lead the way as a pilot, so to speak, for the many historical areas throughout the rest of the city limits.

The bike paths have especially played an essential part in providing the means to spread awareness of the Living River project and recreation along the river. Riders and pedestrians alike report a sense of ownership and pride in bringing the river back to life, a sentiment that has proven to be helpful in the raising of funds and solicitation of manpower. The Watershed Association's restoration efforts are often aided by the same users of the path when monthly clean-ups, planting, and a call for volunteers to assist in various restoration projects are made.

Perhaps the Santa Fe River will never run with the flow rates of the past, especially as the planet faces the challenges of climate change. However, the "Living River" proves that even a trickle of water, released periodically, is enough to drastically improve the landscape and change the dynamic of the ecosystem within an urban setting. More importantly, the reintroduction of water in a "dead river bed," and the subsequent witnessing of life as it returns in the heart line of a city, garners the passion of residents to become the caretakers of their land's main artery. This connection is tangible; in the connection to water, a people are connected to their land—land upon which flows the river that has sustained life for millennia and will continue to sustain life for the next several centuries. This process is a "connecting in" to a bigger story of place and belonging. If rivers are watched over and respectfully preserved according to the needs of the land and ecological forces that created them in the first place, place is preserved and "belonging" as it relates to vegetation, wildlife, and humanity, is the natural consequence (Santa Fe Eco Issues, Beam, 2016).

### **History of the Pueblo: Tesuque**

The Tesuque Native American community provides an excellent local example of enduring

biophilic tradition and longevity. Resilient in a number of ways and well known for leading the way in the Pueblo uprising against the Spanish in 1680 (Suina, 2017).

*The Tesuque people of New Mexico have a longstanding history of resourcefulness as evidenced by their traditional agricultural practices. Located in the foothills of the Sangre de Cristo Mountains, the Pueblo of Tesuque is home to approximately 800 inhabitants. The New Mexico Office of the State Historian states that despite the Pueblo of Tesuque's close proximity to major city centers, including Santa Fe, residents have successfully maintained their culture and traditions intact. Indeed, according to the Indian Pueblo Cultural Center, the Pueblo of Tesuque constitutes &one of the most traditional of all of the Tewa speaking pueblos." Farming and pottery production are the two primary occupations for residents of the pueblo (Northern Arizona University-Tribes: Southwest, Pueblo of Tesuque: Water Scarcity and Fire Management in a Changing Environment, 2017).*

The religion of the Tesuque, as with many religions of the Pueblo Indigenous throughout the region, views life, religious beliefs and culture as inseparable. The harmonious connection with nature is an ideal to be strived for in every action and way of life. For instance, "The sun is seen as the representative of the Creator. Sacred mountains in each direction, plus the sun above and the earth below, define and balance the Pueblo world. Many Pueblo religious ceremonies revolve around the weather and are devoted to ensuring adequate rainfall. To this end, Pueblo Indians evoke the power of katsinas, sacred beings who live in mountains and other holy places,

in ritual and masked dance.” Balance within society is defined through reciprocal relationships, “within which people connect and harmonize with each other, the natural world, and time itself” (what-when-how; Nambe Pueblo (Native Americans of the Southwest, 2017)

In consideration of the importance of nature’s elements and culture in day to day Tesuque Pueblo life, the center of activity, along with dwellings, were and continue to be clustered in a manner that promotes these value systems. In the site plan drawing below, the orientation of structures is strategically placed with agricultural fields and nature surrounding. Interconnected habitats and centralized gathering spaces for the community dominate in the center, the nucleus from which all social and community needs, as well as daily exchanges are carried out.

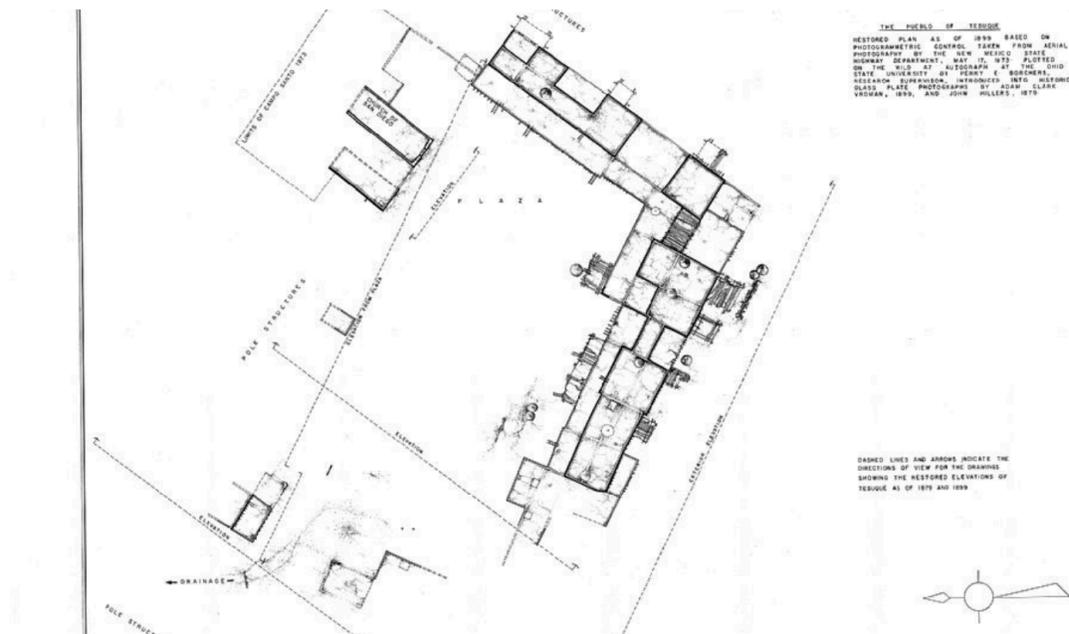


Figure 31

## The Plaza

The establishment of Santa Fe, following the Spanish Colonial tradition of community planning, like the Pueblos, also centered life not only near the water source of the Santa Fe River, yet also around a focal gathering point, or the plaza.

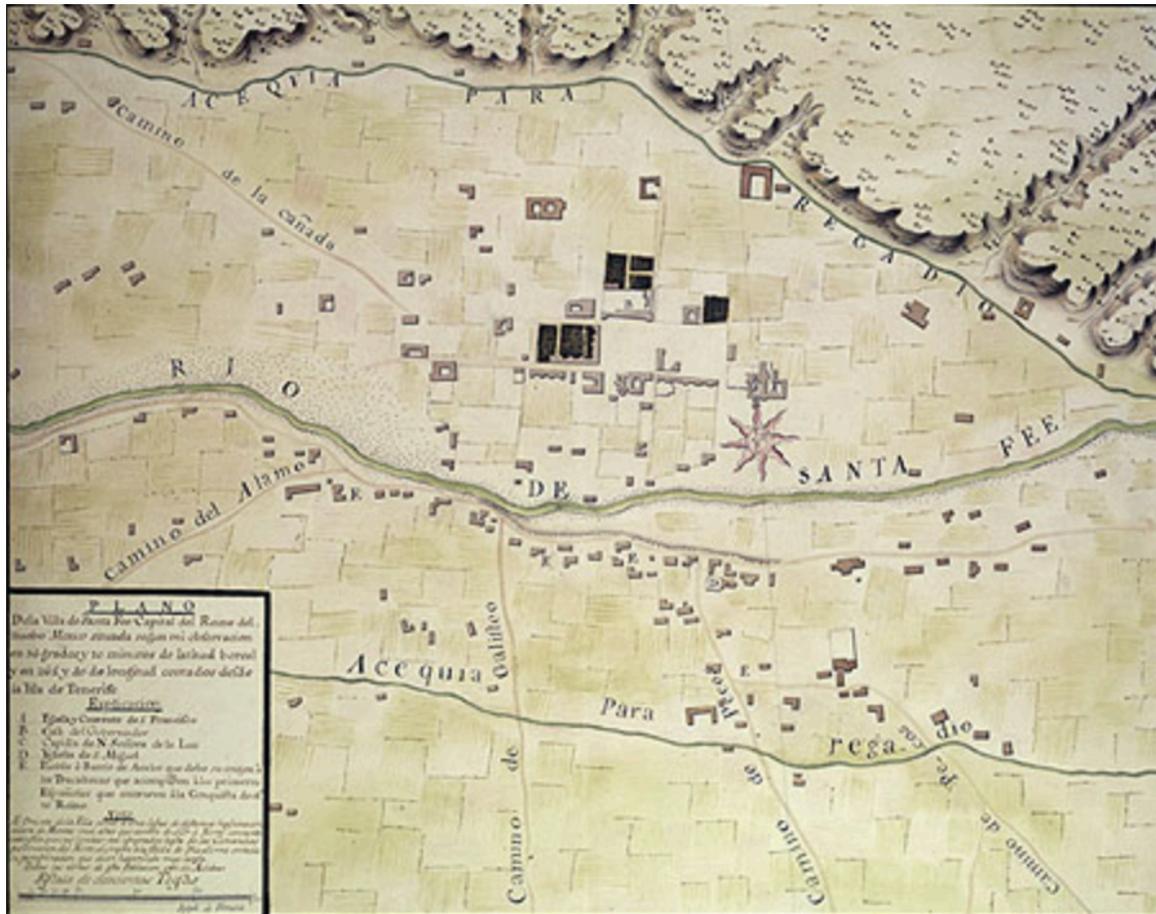


Figure 32

*A 'sustainable city' is organized so as to enable all its citizens to meet their own needs and to enhance their well-being without damaging the natural world or endangering the living conditions of other people, now or in the future. (Girardet 1999: 13)*

Though the wisdom of historical urban and community development provides for every aspect of the previously mentioned recommendations for improving neighborhoods and urban planning in today's world, the practicality of such applications is not feasible in most cases. The overhaul of rebuilding communities from scratch as living buildings and communities in order for inhabitants to experience a more intimate and closer connection to nature in day to day life is an undertaking that would require a great deal of financial outlay; the action of which is not the most sustainable solution for solving the challenge. Rather than new construction, the eco village of Ithaca, a community that has cohabitated as a collaborative community since the early 90's in a similar pattern as has been described throughout this paper, recommends taking small steps in transforming toward greener living. The community suggests that equality in voice, partnership with neighbors and incrementally moving towards more sustainable methods, both structurally and in habits of practice comprise the most successful model for creating longevity and effectiveness in sustainability.

The identification of areas where these steps might be taken within neighborhoods throughout the Santa Fe community is a process that could lead to revitalization and place making; an important shift towards sustainable practices, providing living communities for those residents that are stuck in the suburban sprawl, commute challenge from mid-town to the outskirts of the city.

For the purpose of this paper, one such neighborhood will be selected in order to demonstrate the potential to be found in pocket neighborhood making throughout the city.



Figure 33

## Rancho Siringo

Rancho Siringo is a historical area that was once a large cattle ranch, spreading along an ancient arroyo that often runs from the

monsoons in the mountains toward the southwest direction from the downtown plaza. It is an important arroyo that serves a major role in recharging the main aquafer of the region.

Though the distance is not extreme from the center of town, six miles or so, it requires a 20 minute drive due to traffic and lights. Walking from this location for five minutes in search of a store will only find the pedestrian in the middle of more suburban style settings with no store in sight. The fortunate aspect of this site is the arroyo itself, which due to its importance in natural water management, is protected from development. Bike trails and foot paths run parallel alongside the wild greenway for several miles in either direction, making it a wonderfully accessible conduit for promoting alternative means of transportation as well as supporting recreation in nature. There are situated along the arroyo, a number of housing developments. However, chosen for this paper is the location of the original ranch house, built in the late 1800's by Charles Siringo himself at 2215 Rancho Siringo Rd. The complex now houses the original

ranch house, the ranch hand's original building and approximately ten newer dwellings. The plat of land sits alongside another housing area that also contains as many homes and apartments.

The land toward the east and running along the arroyo was cultivated for several years as a community garden. However, due to unfriendly city policies on urban farming and one neighbor in particular, the couple running the volunteer organization, were forced to return the land to its original wild state. During the time Gaia Gardens was in operation, produce harvested was plentiful and the site served as a delightful place of education for school children tours as well as neighboring volunteers. The emphasis in the organization of the community farm was that of collaborative and participatory, community sharing values. Since the unfortunate departure of the managers of the land, it is a relief to many urban farmers throughout Santa Fe, that city policy has changed toward a more favorable stance; likely due to the urban farming surge in popularity seen world-wide as an acceptable and effective solution to food islands and carbon emissions due to food transport. As demonstrated in communities and cultures throughout the world, agriculture is a natural "knitter" in societies dating back to the very beginning of civilization and therefore, an excellent starting point in the creation of neighborhoods.

The plats shown below outlined in blue and green are the areas to be explored for adapting the "best of" practices to be found in cooperative, nature dependent and participatory neighborhoods and cultures throughout the world.



Figure 34

The pedals, or imperatives shown below, of the living building and living community challenge provide a map for all construction design as well as community planning direction and focus and are the guides for setting up the goals to strive for in retrofitting a neighborhood as well as in new construction. Coming to the industry as the highest standard of sustainable measurement, the living building and community challenges serve to disrupt the status quo and shift mindsets toward new possibilities and methods in construction and design.

## SUMMARY MATRIX

The 20 Imperatives of the Living Building Challenge: Follow down the column associated with each Typology to see which Imperatives apply.

Imperative omitted from Typology Solutions beyond project footprint are permissible

	LIVING BUILDING CHALLENGE 3.1			
	BUILDINGS	RENOVATIONS	LANDSCAPE + INFRASTRUCTURE	
PLACE	SCALE JUMPING		SCALE JUMPING	01. LIMITS TO GROWTH
			SCALE JUMPING	02. URBAN AGRICULTURE
			SCALE JUMPING	03. HABITAT EXCHANGE
			SCALE JUMPING	04. HUMAN-POWERED LIVING
WATER			SCALE JUMPING	05. NET POSITIVE WATER
ENERGY			SCALE JUMPING	06. NET POSITIVE ENERGY
HEALTH + HAPPINESS				07. CIVILIZED ENVIRONMENT
				08. HEALTHY INTERIOR ENVIRONMENT
				09. BIOPHILIC ENVIRONMENT
MATERIALS			SCALE JUMPING	10. RED LIST
				11. EMBODIED CARBON FOOTPRINT
				12. RESPONSIBLE INDUSTRY
				13. LIVING ECONOMY SOURCING
EQUITY				14. NET POSITIVE WASTE
				15. HUMAN SCALE + HUMANE PLACES
			SCALE JUMPING	16. UNIVERSAL ACCESS TO NATURE + PLACE
				17. EQUITABLE INVESTMENT
BEAUTY				18. JUST ORGANIZATIONS
				19. BEAUTY + SPIRIT
				20. INSPIRATION + EDUCATION

Figure 35

THE 20 IMPERATIVES OF THE LIVING COMMUNITY CHALLENGE		
	LIVING COMMUNITY CHALLENGE	
PLACE	SCALE JUMPING	01. LIMITS TO GROWTH
		02. URBAN AGRICULTURE
		03. HABITAT EXCHANGE
		04. HUMAN-POWERED LIVING
WATER	SCALE JUMPING	05. NET POSITIVE WATER
ENERGY	SCALE JUMPING	06. NET POSITIVE ENERGY
HEALTH & HAPPINESS		07. CIVILIZED ENVIRONMENT
		08. HEALTHY NEIGHBORHOOD DESIGN
		09. BIOPHILIC ENVIRONMENT
MATERIALS		10. RESILIENT COMMUNITY CONNECTIONS
		11. LIVING MATERIALS PLAN
		12. EMBODIED CARBON FOOTPRINT
EQUITY		13. NET POSITIVE WASTE
		14. HUMAN SCALE + HUMANE PLACES
		15. UNIVERSAL ACCESS TO NATURE & PLACE
		16. UNIVERSAL ACCESS TO COMMUNITY SERVICES
BEAUTY		17. EQUITABLE INVESTMENT
		18. JUST ORGANIZATIONS
		19. BEAUTY + SPIRIT
		20. INSPIRATION + EDUCATION

Figure 36

Transformation of the identified neighborhood of Rancho Siringo will require an overall site plan, addressing the main steps considered important and to be taken as a community. The first step in any community project is the collection of opinions, needs and ideas, followed by the generation of solutions. Important questions include many of the following addressing social and economic needs: Is community disconnection more important than nature disconnection for the inhabitants in the complex? What about privacy concerns and responsibility for areas residents are

not interested in? Is water management the first place to start, given the need for food in the food island challenges that this site represents. Or, are the costs of energy at such a level that the residents feel strongly about the immediate addition of passive solar green houses to their homes? What about the children? Where do they fit in to the priorities? How important is it

that they have a shared, safe play area surrounded by nature? All of these inquiries and more are just the beginning of the questions that need to be asked in order to cooperatively strategize based upon priority for everyone involved.

Remembering the neighbor and city policies that dismantled the best efforts of a couple who brought life and many of these qualities to the neighborhood previously, it is important to consider the behavioral and freedom of choice menu options that are available to members of all neighborhoods: To participate, or not, to fight change or fight for change. Identifying what matters most to those involved as well as what is possible as far as policy is concerned is a crucial first step in a project such as this.

The proposed site plan below: The removal of walls and fences, bringing back the community farm for the neighborhood to use and work together in, as well as rain gardens, a children's play area and establishment of community gathering spaces, has been created without input from the chosen community, merely for the sake of this paper. The site plan offers a view that is only slightly different from that of the suburban sprawl currently surrounding and yet in it lay the seeds in fertile ground to sprout a plethora of connecting possibilities—possibilities that are available in all neighborhoods and cities when thinking outside of traditional suburban patterns.

In the Rancho Siringo site, particular attention is focused upon the need for water harvesting and recycling due to the high desert climate of the location, cultural value of the Santa Fe River, and the simple steps that can be taken to substantially conserve the precious water that is so very vital to all life.

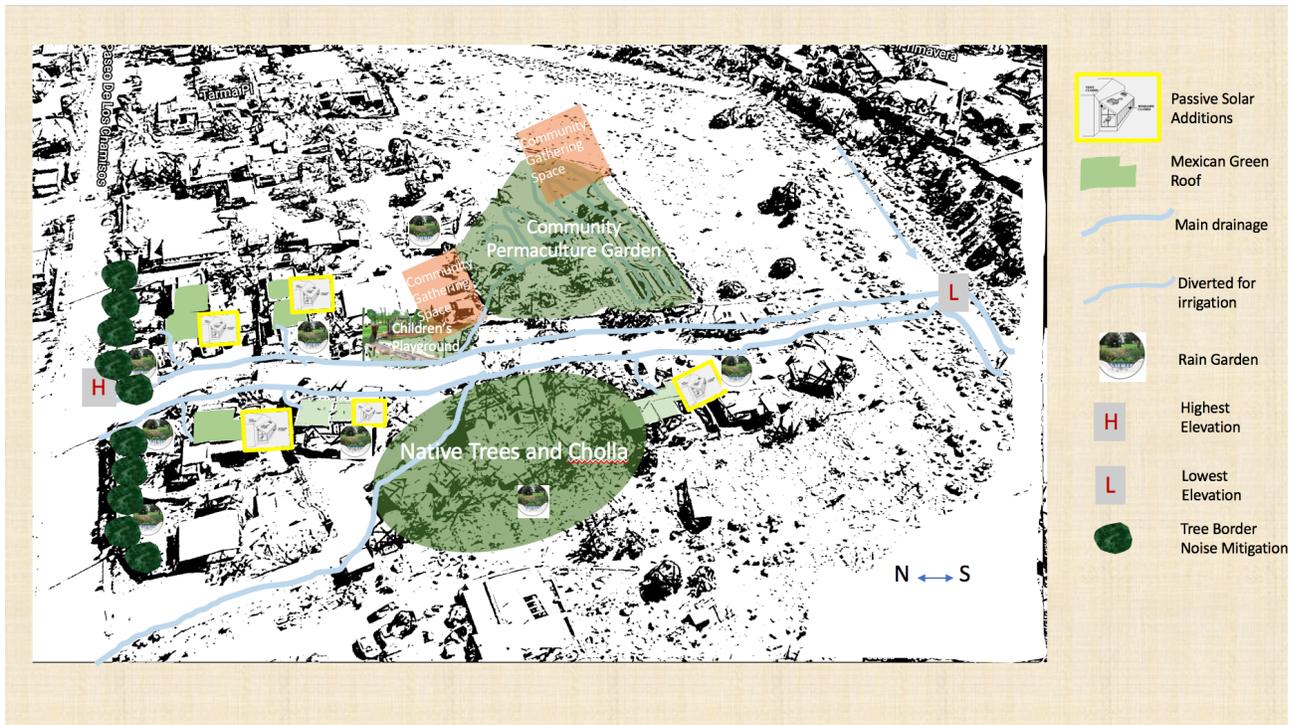


Figure 37



Figure 38

The continuation of incremental steps toward the additions shown on the previous page in the structures and on the land, provide the gradual transformation toward a groups' active involvement in their environment and the ecosystems upon which they rely. In other words, an interactive relationship with nature and the forces of nature.

## **10. Conclusion**

*Very little money flows into authentic community development activities i.e. where local people are encouraged to engage with each other and the issues that face them, and then to organize. Central government has still to come to terms with the cultivation of social capital. Here the issue is that resources are needed but the more governments interfere – the more likely they are to destroy the networks and relationships that are needed to be developed and sustained (Infed, 2017).*

The tour through which the reader has been led offers a macro to micro journey into the possibilities for a different and more natural path than we have traversed in the past 100 years. Fortunately, our ancestors and many remaining cultures possess a great deal of knowledge that is still available for application today. Science shows definitively that the brain is healthier on nature, that mental health is improved in green buildings, and that soil under our fingernails brings about a sense of calm and increases our immune system. Yet it is almost too simplistic for those who are accustomed to the hurry-scurry, stressful chaos of urban centered life, to believe. The implication in this finding is that any introduction of more nature, exposure to scenery, direct contact with nature, in an area, a habitat, a school, a hospital, will bring about more emotional well-being. All we have to do is start planting.

The data shows the same strong connection to mental health and resiliency in the social realm also. People need people. People need to feel connected to others in a way that is

meaningful and that they can trust. Culture can support or tear down this need. However, the culture of a *nature* dependent community: A community that values their surroundings, gardens together, collects water together, plants trees together, cares for the preservation and beauty of the land, water, and air—*together*, provides an opportunity for a shared, mutually common bond with each other and the very creative forces upon which we rely for our existence.

Structures, community planning, federal and local policy can support the connected human story and provide essential benefits for survival and thriving which date to the beginning of time for all species of life on this planet—if we just start with a seed of love and desire to link with each other and our planet in collaborative, interdependent design, intention, and effort; the way of nature--of which we are all, inextricably a part.

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