

Static Versus Mobile Architecture: A Comparison of Solutions for Homelessness in
Hawai'i

by

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Abstract

Within the context of modern sustainable development, there is a movement of human sustainability, which focuses on the value of human life and the problems that threaten that life. One problem found in Honolulu, Hawai'i is a large homeless population. Mobile architecture—understood in this case as single-family homes on non-permanent foundations—presents opportunities to draw distinct connections to the issues that cause this homelessness problem. Static tiny homes—understood here as single-family homes on permanent foundations with an area of 500 square feet or less—presents a different set of strengths when addressing the same problem. This analysis weighs the use and stability of static tiny homes against the cost and mobility of mobile tiny homes, concluding that static tiny homes better solve the issue of homelessness in Honolulu, Hawai'i.

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Chapter 1: Introduction

Many environmentalists date the modern sustainable development movement to the publication of *Silent Spring* by Rachel Carson in 1962. This marked the first published analysis of the environmental dangers of pesticides used on crops bringing such issues into mainstream discourse for the first time (Palmer, 2003). Out of this concern, the sustainable development movement developed into a critical analysis of human interaction with the environment. This publication sparked a nascent awareness of environmental issues toward the modern sustainable development movement, which then led to the world's first environmental conference in Stockholm, Sweden, in June 1972. The conference succeeded in setting forth a declaration of 26 principles concerning the environment and development. These 26 principles focus on the issues facing sustainability at that time. Some of the issues include the responsibilities of humanity toward the environment and the role of science and technology in sustainability.

By 1975, environmental philosophers such as Peter Singer and Eugene Hargrove began to publish essays concerning the rights of non-human animals, plant life, land, and water, and the morality of human interaction with a non-human environment. As the field of sustainable development advanced, schisms began to form in the ethical frameworks surrounding sustainability issues. In *An Overview of Environmental Ethics*, Clare Palmer outlines these different trajectories, charting different ethical approaches around sustainable development (Palmer, 2003).

The first of these approaches is the “anthropocentric” approach, which assumes that nature must have an instrumental value as a resource to humankind. Within this

approach, nature is assumed to have no real inherent value, but only value based on its usefulness to humans (Palmer, 2003). It is this notion that the value of nature only exists relative to humans that marks this approach as anthropocentric. It also demonstrates how much the anthropocentric approach exploits the environment. On this model, nature is subservient to human needs, uses and desires, framing conservation and sustainability as human care or stewardship for nature. The second approach that Palmer addresses is the “individual consequentialist” approach. This states that ethics should aim at the most ideal consequences. In this model, it is the current condition of the organisms involved that assigns the relative value of the ecosystem or species. This places the human in the position of deciding what is considered best in terms of individual organisms, or more specifically, the state of affairs within the organism, calling into question the issue of replaceability. The idea being that a person could kill an animal, assuming the animal would feel no pain, and replace it with another without acting unethically. The utilitarian nature of individualist consequentialism adheres to this notion of replaceability by holding total experience as valuable – rather than the actual organism (Palmer, 2003). Palmer next focuses on the “individualist deontological” approach, which places value on individuals rather than on whole systems or species. Palmer’s third and final approach is the “holistic environmental ethics” approach. As the antithesis of individualistic deontology, holistic environmental ethics focuses on ecological wholes, such as entire species, biospheres, and ecosystems (Palmer, 2003).

As the issues surrounding sustainable development grew in their evident complexity, further divisions had to be drawn in order to better detail the many

trajectories of the movement. Many different distinctions and designations come along with this need to clarify. One of the most popular methods of definition separates sustainable development into four categories, or pillars: [1] environmental; [2] economic; [3] social; and [4] human. Each of these four pillars focuses on a specific set of issues and themes within the movement.

The environmental or ecological pillar deals with understanding and acknowledging the plethora of problems facing the natural environment. It is the most commonly known area of sustainable development, as it encompasses issues of climate change, pollution, energy, and water (Kates, Parris, & Leiserowitz, 2005). Perhaps the most political and publicized area in sustainable development, this pillar also has the most impact on the other three pillars. This is due mostly to the ubiquitous nature of pollution in the world today.

The economic pillar of sustainability addresses issues in the labor market, infrastructure, agriculture, and general economic development. Economic sustainability operates on the idea that economic capital should be maintained. It does not, however, consider natural capital, such as intact forests or unpolluted nature, in its considerations. Central to this pillar is the notion that all economic value is expressible and reducible to monetary value.

The social pillar focuses on maintaining social capital. Many of the issues surrounding social sustainability involve the connections between society, crime, tolerance, and other civil issues, such as social equity and social justice. Often, social sustainability relies on a system of shared values between individuals and/or between groups of people. Through shared values, social sustainability can be implemented in

the form of laws and shared information, which is necessary for the cohesion of the society. Without these laws and shared information, it would be difficult for large groups of individuals to come together and form a society (Kates, et al., 2005).

The final pillar of sustainability, the human pillar, focuses on the maintenance of human capital or, simply put, the human pillar values human life. This includes, but is not limited to: health; education; skills; and leadership of people. Some of the most prominent issues that arise when considering human sustainability are population growth, consumption, and civilization. This pillar is often confused with social sustainability when it addresses issues such as civilization and social justice; in the case of human sustainability, these issues deal with instances of population density and homelessness.

This final pillar of human sustainability is an increasingly challenging problem in today’s world and can be seen especially in the areas of [1] overpopulation and [2] homelessness across the globe. Two countries with the most severe cases of overpopulation, as of 2015, are China and India with 1.367 billion people and 1.251 billion people respectively

(Brinkhoff, 2015). Within India’s 1.251 billion population, there are an estimate 78 million homeless people, including 11 million homeless children (“Global

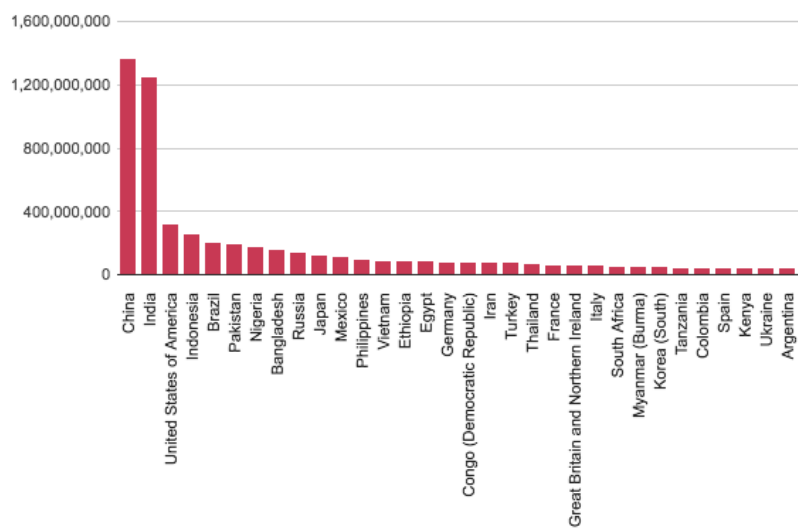


Figure 1: Bar graph of population by country (Brinkhoff, 2016).

Homelessness Statistics,” 2016). Even countries with less pronounced overpopulation concerns, homeless communities are a persistent presence. One prominent example is the current homelessness problem facing Honolulu, Hawai’i, with a homeless population of over 7,000 people (Reid, 2016). Due to its island context, this problem is effectively more severe in Honolulu than in other contemporary American cities. With less room for the city to expand, the large homeless community is concentrated into a dense space, thereby exhibiting the problems caused by homelessness more prominently than in landlocked areas. Many different solutions are being put into effect to solve these problems, with varying degrees of success. One potential solution could be found in architecture.

Frank Lloyd Wright (1939) defined architecture as “life, or at least it is life itself taking form and therefore it is the truest record of life as it was lived in the world yesterday, as it is lived today or ever will be lived.” Through its long, incremental, and evolutionary history, architecture has been separated into several main categories of



Figure 2: The Guggenheim Museum; a commercial building designed by Frank Lloyd Wright (Ford, 2014).

building: commercial; industrial; landscape; and residential (“What Are The Different,” 2016). In some cases, these focuses can overlap or interact with each other. Commercial architecture refers to any building used for non-residential uses, such as office space, schools, retail, stadiums, and countless other types of structures. Industrial architecture involves structures such as hydroelectric dams or bridges. Landscape architecture

focuses on outdoor areas such as parklands, and garden, often overlapping with residential projects, which include some form of yard. Residential architecture, on the other hand, deals with buildings that are used as habitation for individuals or groups of people – most often associated with the family unit. Within residential architecture are more detailed classifications: multi-family and single-family. Multi-family residential architecture ranges from duplex houses designed for two families to large apartment or condominium buildings design for hundreds of families. Single-family residential architecture is designed to accommodate a single family according to their needs.

Within single-family residential architecture, there are a variety of sub-categories, which address everything from scale to performance. One of these sub-categories is tiny architecture, which a recent addition to the California zoning code defines as a “second dwelling unit” with less than 1,250 square feet of floor area (“New Zoning Code,” 2015). Tiny architecture may be subdivided into mobile architecture and static architecture. Mobile architecture includes any building that can be easily moved from one place to another. This is most often accomplished with the integration of a foundation with mobile parts, such as a trailer, into the structure of the home. Merriam-Webster (2011) defines a mobile home as “a dwelling structure built on a steel chassis and fitted with wheels that is intended to be hauled to a usually permanent site”. With this definition, it becomes possible to understand exactly what is entailed when discussing mobile architecture. Mobile architecture does not, however, include houses that can be removed from their foundations, moved in pieces, and reassembled in another place. To be considered mobile architecture, the structure must be designed with ease of mobility in mind. This also accommodates standard transportation laws

and codes, which designate that a road-legal mobile residence cannot exceed a width of 8'-4" x 40'-0" ("Road Limits for Tiny Homes," 2009). As a result, most mobile architecture averages 186 square feet of gross area ("What is the Tiny House," 2009).

Mobile, or portable, architecture is an idea that is rising in popularity. This rise may be attributed to a number of considerations. It is important to note that this concept of mobile homes focuses on homes that are designed and built to function as a home, and it does not refer to vehicles, such as standard RVs, pop-up campers, or homes that require heavy machinery, such as cranes, to be moved. It focuses solely on homes designed and built to be moved quickly and easily, and designed for long-term housing. The first aspect that contributes to the increasing interest in mobile architecture is the affordability of these homes. With fewer square feet to build, less materials and labor are required for their construction, allowing more people, potentially, to afford building a mobile home ("Why Tiny Houses," 2014). Another attractive feature of a mobile home is the limited space. Though it may sound strange at first, a lack of space can be advantageous for both home and homeowner in a variety of ways. Many mobile tiny home residents claim that living in a smaller home led them to having a much stronger sense of community. Less time is spent in the house, more time is spent in the community, and more time is spent in communion with nature ("Tiny House FAQs," 2016). Due to these benefits of mobile homes, the concept has risen in popularity. Today, several online blogs have been founded upon and dedicated to discussing tiny home living, encouraging others to downsize their own living conditions. As a result, many architecture firms and contracting companies have begun advertising tiny homes in their portfolios.

Alternatively, static, or fixed, tiny homes are specifically houses built on permanent foundations, such as piers, poured concrete, or concrete masonry unit foundation wall. A permanent foundation also increases the stability of a home. Since a static tiny home is restricted to a single site, the building can feel more like a stable home, whereas a mobile tiny home can be moved regularly, causing the resident to feel less stable. Although static tiny homes are small relative to the average residence, they are able to achieve greater floor area than mobile tiny homes. Static tiny homes may range from as few as 100 square feet in area to almost 500 square feet according to some. The maximum square footage of a static tiny home is often debated due to the fact that a house that is small for a family of four could be considered large for a single resident. The number used to define the maximum size of a static tiny home ranges from as little as 250 square feet to 1,000 square feet. The most common classification is a static tiny home of 500 square feet (“Tiny House FAQs”, 2016).

One of the positive aspects of living in a tiny home, static or mobile, is that it begins to address some of the issues that impact human sustainability. In tiny architecture, there are fewer square feet occupied per person. With fewer square feet occupied, people can begin to call attention to the value of human life by reducing the size and scale of housing, and housing can become affordable for a larger percentage of the population, particularly the homeless (“What is the Tiny House,” 2009). Fewer square feet also entails fewer personal belongings can be stored in the tiny home, further decreasing the average consumption of an individual. This enables the Hawai’ian state government to begin addressing issues such as the homelessness problem in Hawai’i. With people residing in smaller areas, it increases the population

that the earth is able to sustain. This also leads to less consumption. The average single-family residence in United State consumes almost 14 times as much lumber as the average tiny home. Tiny homes also use significantly less energy and time to construct. A variety of considerations make it reasonable to suggest that tiny architecture is a better solution to the homelessness problem in Honolulu than its mobile counterpart.

Chapter 2: On Sustainability

As outlined above, modern sustainable development divides sustainability issues into four pillars. These pillars are: [1] environmental; [2] economic; [3] social; and [4] human. The environmental pillar addresses issues that relate to the ecological health of the natural environment as impacted by humans, including issues such as poaching, pollution, ozone depletion, climate change, and countless other issues that are directly or indirectly caused by human involvement. The economic pillar focuses on issues including labor markets, infrastructure, agriculture, and general economic development. The social pillar deals with social issues such as crime, law, and governance. Finally, the human pillar addresses the issues of population growth, consumption, and civilization. To understand the problems that arise in the discussion of human sustainability, a more in-depth analysis is needed.

The first, and most publicized issue in human sustainability is population growth, specifically overpopulation. Merriam-Webster (2011) defines overpopulation as “the condition of having a population so dense as to cause environmental deterioration, an impaired quality of life, or a population crash.” When the birth rate of a certain area is significantly more rapid than that area’s death rate, overpopulation emerges as a potential issue. A 2001 study conducted by the United Nations shows long-term evidence that a global

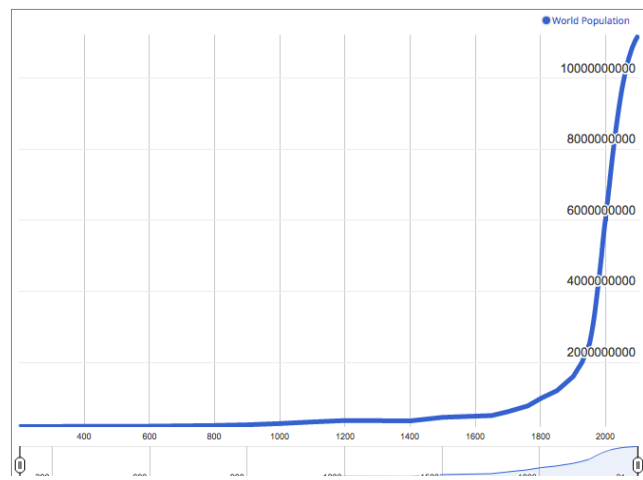


Figure 3: Line graph showing the exponential growth of human population (United Nations, 2003).

overpopulation crisis looms. The study states that in the 20th century, world population grew from 1.6 billion to 6.1 billion, with 85% of this growth taking place specifically in Asia, Africa, and Latin America (United Nations, 2003). In the 13 years after this study was published, the population had grown by over one billion people to a current total of 7.419 billion people ("Current World Population," 2016), suggesting that population growth is an exponential problem.

When overpopulation becomes an issue in a specific area, specific related issues begin to arise. According to Ehrlich and Ehrlich (1990), the president of Stanford's Center for Conservation Biology and his wife, an area becomes overpopulated when the population can no longer be sustained without depleting its nonrenewable resources. Ehrlich and Ehrlich related this issue specifically to food and agriculture. When a population becomes so large that it cannot produce enough food to feed its entire people, it creates more serious issues such as starvation. This idea is predicated on the premise that Earth has a finite carrying capacity, or an ideal population level. As the world population rises above this tipping point, issues caused with consumption will increase, leading to consequences such as starvation, deforestation, species extinction, and disease.

The population falls back below the ideal line due to increased death rates. Once below this line, Ehrlich and Ehrlich believed that humanity would have an abundance of food, the death rate would decrease, and the birth rate would increase. World population would rise above the ideal point, and create a cycle of overpopulation. As the world population spends increasing amounts of time above the

ideal carrying capacity, the limits of food sources will decrease causing the ideal population to decrease and eventually, become completely unsustainable.

The homeless situation of an area increases as the overpopulation of an area worsens and with increasingly limited resources, such as a lack of affordable land and housing (Gaetz, Donaldson, Richter, & Gulliver, 2013). It is a fundamental problem that faces modern civilization, with causes that can be identified in countless metropolitan areas around the world. It causes citizens to lose their homes and live on the streets. One of the starkest – and unique – examples of the homelessness problem may be found in Honolulu, Hawai'i.

As of January 2016, Hawai'i hosts over 7,000 homeless people, earning the distinction of the highest homeless population per capita rate in the United States (Reid, 2016). One of the most prevalent causes of this homelessness is the cost of living in Honolulu. Renting a one-bedroom apartment in the city costs over \$1,200 per month on average ("Homelessness in Hawai'i," 2011), which is beyond the financial capabilities of more than 30% of Hawai'i's population. This is partially due to the overwhelming allure of tourism in the area. To meet the demand of tourism, a high percentage of the jobs in Hawai'i are basic retail jobs selling souvenirs to visitors. Even with a minimum wage of \$8.50 per hour in Hawai'i ("Wage Standards Division," 2016), many of the retail jobs pay their employees a mean wage of \$12.51 per hour in an effort to help them make ends meet. This is significantly higher than the national average wage for similar jobs at \$10.57 ("Occupational Employment," 2015). Even with this pay increase, many locals have to work several jobs to be able to afford the expensive rent payments.

Another factor that contributes to the homelessness in Hawai'i is the tropical weather common in the south pacific islands. Some percentage of the homeless population in Honolulu consists of people who became homeless and decided to make their way to Hawai'i so that they could be more comfortable living on the streets. This sometimes takes the form of tourists who arrive in Hawai'i and then don't have enough money to make the return trip home. The Hawai'ian government has developed and enacted countless programs to help alleviate this issue, but none as yet have been successful in decreasing the rate of homelessness in the area.

The most widely enacted program in Honolulu is the construction of new homeless shelters, which often have to turn families away due to occupancy limits. The Hawai'ian state government has also tried funding the mental health services on the island in an attempt to make the service

available to anybody in the area. The government has even resorted to more extreme measures such as a ban on sitting or lying on sidewalks in the city.

They even went so far as to counsel local churches and other locations that



Figure 4: A homeless encampment on Waikiki, Hawaii (Reid, 2016).

provide free food to the homeless to withhold their services in the hope that it will encourage the homeless to improve their situation ("Homelessness in Hawai'i," 2011).

In an area such as Honolulu, there are a number of negative effects of homelessness, both on the individual and the community. One of the negative effects on an individual is health issues associated with being homeless. Some of the health issues

that have been linked with homelessness include hypothermia, cardio-respiratory disease, tuberculosis, skin disease, nutritional deficiencies, sleep deprivation, mental illness, assault, and drug abuse (Hart-Shegos, 1999). These problems arise due to a lack of attention from people such doctors, spouses, or family members. There are also personal psychological issues that come with homelessness. This is often onset by the realization that a person experiences that they will not have a roof over their head for the first time in their life. Some ways these manifests include loss of self-esteem, loss of will, increased risk of violence, and the development of behavioral problems (Hart-Shegos, 1999).

These problems and their causes are visible in Hawai'i as well as around the globe and are causing detrimental damage to the human race. Overpopulation is increasing past the Earth's limits, consumption is destroying our ability to successful provide for humankind, and homelessness is causing detrimental damage to individuals and communities. For these reasons, they fall under the category of human sustainability. One potential solution to these problems arises through a considered study of the role of architecture.

Chapter 3: On Architecture

Architecture is, of course, an extremely broad and complicated topic. Only by delving deep into the subcategories that define the built environment can one begin to understand how architecture applies directly to the modern sustainable development movement. First, architecture is divided into several main categories of building: commercial, industrial, landscape, and residential. Commercial architecture includes buildings used for business use, such as corporations, hospitals, schools, sporting events, and countless other uses. Industrial architecture generally includes civil projects such as dams and bridges. Landscape architecture deals almost exclusively with the outdoors, such as parks and gardens, often in the form of large urban projects or ornamenting a site with plant life. Residential architecture, on the other hand, includes buildings used for housing. This includes single family houses, multifamily housing, owner-occupied housing, and any other type of domicile.

Within residential architecture, there is a category outlined by Narvydas (2014), a professor of architecture at Kaunas University of Technology in Lithuania: sustainable residential architecture. For a residential project to be considered sustainable, according to Narvydas, it has to possess three main criteria. First, the project must follow the principles of sustainable construction, including using resources rationally, using ecological materials, creating a healthy and safe environment, social cohesion, social justice, quality of life, cultural diversity, and economic welfare (Narvydas, 2014). Secondly, the project should align with the principles of sustainable development such as compact urban development, and ecology. Finally, residential architecture should be regulated by institutional management. Management guarantees the development of

sustainable strategies in the built environment. These guides ensure that sustainable residential architecture conforms to the goals of the human sustainability movement by creating incentives for sustainable building practices such as tax breaks (Narvydas, 2014). Many of the projects that are considered to be sustainable residential architecture vary drastically from one another, to the point that more subcategories need to be outlined.

Within the category of sustainable residential architecture, there are multi-family projects and single-family projects. As the name suggests, a multi-family residential project is any building that is designed to permanently house two or more families. Likewise, a single-family project is designed to only house one family of average size of 2,600 square feet ("Why Tiny Houses," 2014). These projects range from one bedroom to around four bedrooms in size. They are smaller than their multi-family equivalent as a rule, and often use less space and materials.

There are many different types of single-family sustainable residential projects. They can come in the form of a cabin, a standard stand-alone house, or a tiny-house. The tiny house movement has roots in Native American culture, with the use of the traditional tipi ("Tiny Houses of the Past," 2013). With minimal square footage, the tipi was a small living enclosure that could be packed up easily, and moved to a new location. Eventually the movement advanced to more mobile-ready designs, such as the



Figure 5: A "shotgun" style home in Virginia ("Tiny Houses of the Past," 2013).

horse drawn cart, which was used as living quarters by Romani in Europe in the 15th century (“Tiny Houses of the Past,” 2013). Eventually, tiny houses began to become popular in a more urban setting such as this 7'-0" x 36'-0" tiny home in Virginia which was built around 1830. These houses were given the name “shotgun houses” based on the idea that a shotgun fired at the front door of the house could hit the back door without hitting any wall. It denotes a long, thin floor plan that is particularly common in the New Orleans area (Campanella, 2014). This “shotgun” style house began to gain popularity due to the small amount of space that the house required on the road. The properties were cut down to less than 10 feet wide and then developed with a shotgun house to fit the restricted area.

In the 1840's, Henry David Thoreau conducted an experiment in simple living. Thoreau built a 150 square foot tiny home in the woods of Massachusetts. For two years, he lived in this small cabin near Walden Pond. Although it was not intended to be a long-term home, Thoreau was able to live comfortably throughout the duration of his experiment. This led to some of the rising popularity of the tiny home idea.



Figure 6: Recreation of Thoreau's Walden cabin ("Tiny Houses of the Past," 2013).

Over a century later, tiny-homes became mobile. With the introduction of the trailer camper, it became possible to have a small home that could be easily and regularly moved from place to place. These campers were not often used as an exclusive home, as most owners would take them out for vacations, but they were still functional

as a single-family residence with living areas, bathrooms, showers, and kitchen areas included. As technology advanced, some tiny homeowners have managed to keep their homes almost entirely off the grid by using solar panels to charge batteries, which can be used on-demand as needed. The majority of tiny homes, however, use significantly less energy to operate than larger residences do, enabling them to “live” more easily off of a solar array (“Tiny Houses of the Past,” 2013).

Within this tiny home movement, there are two main types of tiny homes, both of which have been mentioned previously.

The first is the static or fixed tiny home; these can range from 100 square feet in extreme cases, to as large as 500 or 1,000 square feet (“Tiny House FAQs”, 2016). These are houses with a permanent foundation that is not designed to be disassembled and moved easily. Some static tiny homes can be moved, but doing so often requires excessive labor, permits, and large trucks. They are often moved only in special circumstances and even then, moved only once in their lifetime.

The other type of tiny home is the mobile tiny home. These are homes that are designed to be moved quickly and easily. The size of these homes can range from as small as 42 square feet in some cases, such as in



Figure 8: The Cabin on Stilts: A 350 square foot static tiny home ("Skip the Trailer, 2015).



Figure 7: The Rolling home: a 42 square foot mobile tiny home (Walker, 2000).

this rolling home, to as large as about 200 square feet (Walker, 2000). Although typical prefabricated mobile homes are counted in this category, mobile architecture generally refers to designed and built houses, normally using wood framing that are framed on top of a trailer or similar movement method.

From these definitions of static and mobile architecture, parallels begin to emerge between the all types of tiny homes and the problems facing Honolulu, Hawai'i. As these parallels become more defined, a comparison can be made between static and mobile tiny homes as a remedy to the homelessness population in Honolulu. Although both static and mobile tiny homes show significant potential in alleviating the causes of homelessness in Hawai'i, static tiny homes seem to address the issues more thoroughly than mobile tiny homes.

Chapter 4: On Relationships between Homelessness and Tiny Architecture

Many of the qualities of tiny architecture are directly connected to issues surrounding human sustainability. These qualities are in some cases a possible solution to an issue of human sustainability, and some qualities are instead a reaction to the conditions of human sustainability. In either case, it is important to understand these connections, and to see how they may further sustainable development.

The first issue that needs to be addressed is consumption. With an ever-challenging ideal of “bigger is better” in the world, resource consumption is a major problem. Tiny architecture has begun to address some of these issues in several ways than one. The most obvious way that mobile architecture does this is by having a relatively small size. This diagram

illustrates the difference in size between the average mobile home and the average single-family residence. With an average of 186 square feet, there is an immediate difference in the amount of material used to construct a mobile home. Just looking at lumber, the

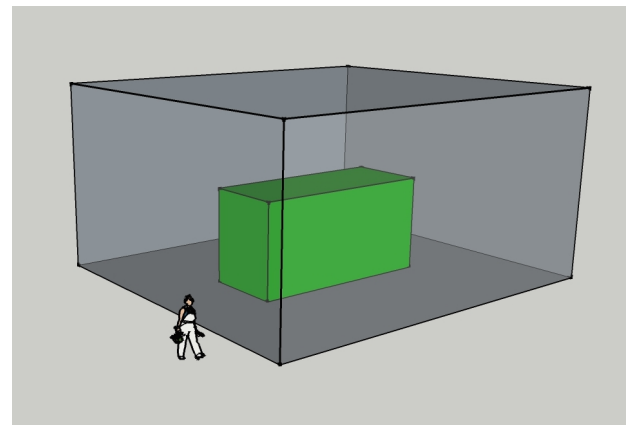


Figure 9: A massing study between the average mobile tiny home and the average single-family residence.

average tiny home, at 186 square feet, uses only 1,142 board feet of lumber and 1,000 square feet of other lumber products (Emrath, 2016). The regular home, at an average of 2,600 square feet, uses about 14 times as much lumber requiring on average, seven total truckloads to drive from the lumberyard to the building site just to frame the house (“Why Tiny Houses,” 2014). Considering that over three quarters of the lumber

consumed in America is attributed to construction, using significantly less wood in a residential project could massively cut down the overall consumption of forested areas, assisting in getting deforestation down to a sustainable rate (“Why Tiny Houses,” 2014).

The issue of consumption is also addressed in static tiny homes, as they too are significantly smaller than the average residence. It does not, however, address the issue of consumption as well as the mobile tiny home, since static tiny homes are often larger than mobile tiny homes. Due primarily to their permanent foundations, they require more labor and expertise in their construction. Although mobile tiny homes also need a high level of skill to design and construct, static tiny homes require additional skills such as civil engineering, correct concrete construction methods, and a better understanding of architectural statics. For example, it takes more skill to design an adequate foundation to support the loads of a static tiny home, whereas the foundations for a mobile tiny home are often prebuilt to support the loads that are common in mobile tiny home construction.

There are similar comparisons of almost every component of a finished building, even down to the lamps used. An average mobile tiny home uses 6 lamps consuming approximately 85.2kWh of energy every year. Larger homes, however, use 45 lamps, consuming about 639 kWh of energy annually (“Why Tiny Houses,” 2014). These drastic differences in energy costs have a correlating effect on the CO₂ emissions from a structure. Between electricity, heating, and cooling, tiny homes give off an average of 2,000 pounds of CO₂/year compared to normal sized houses of 2,600 square feet, which come in at 28,000 pounds of CO₂/year, or 14 times as much in American houses (“Why

Tiny Houses, 2014). Such a dramatic difference is due only to the consumption of power to maintain a comfortable living environment year round.

As far as consumption goes, all of the aforementioned connections apply to all tiny homes, static and mobile. Mobile architecture does, in the interest of a fair comparison, possess an advantage in terms of consumption due to one factor that is crucial to the designation of “mobile architecture”. That factor is that it cannot, by definition, have a permanent foundation that integrates the structure with the site on which it stands. Although it is not normally considered a form of consumption, building a permanent home on a site does, in fact, consume that site. Although the site consumption is reversible, it does occupy the site for the duration that the building remains. That footprint may no longer be used for any purposes which normal, unaffected ground might be used. Other effects on a site could include displacement of soil and plant life, as well as an impact on the natural water run-off in the area. Since mobile architecture effectively has no permanent footprint, it significantly reduces the consumption that a building entails.

In conjunction with mobile architecture’s connection to the consumption problem, it also has an unexpected connection to the problem of overpopulation, which is an ever-increasing issue in the field of human sustainability. A recent study by the Pew Research Center (Gao, 2015), looked at the changes in ideal family size in America. According to the study, the ideal family size in 1936 was at an average of 3.6 children, with 22% of participants claiming that four children was the perfect family. By 1971, that number had shifted to 2.9 children with 19% of people still claiming that four children was ideal. In 2013, the study revealed that the number had decreased even

further to 2.6 children, now with a near majority of 48% of people claiming that having two children was ideal.

In addition to looking at the interesting shift in American preferences, the Pew Research Center also looked into what was causing these shifts in the average family size (Gao, 2015). One of the greatest

factors, to which they attributed this shift, was the cost of raising a child to 18 years old. Over the past 55 years, the cost of raising a child has increased from around \$198,000 to \$245,000. With an increase of almost \$50,000 per child over the course of

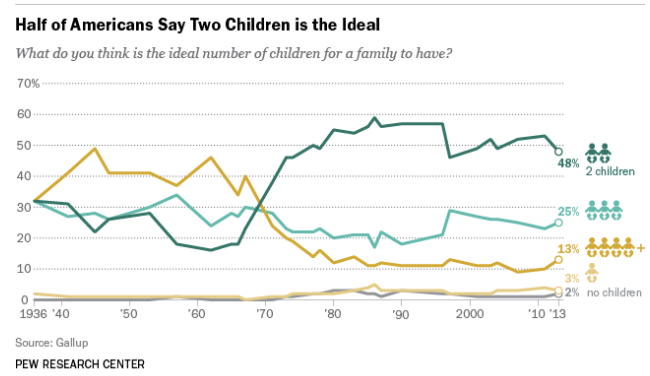


Figure 10: Comparative line chart of preferred family size over time (Gao, 2015).

18 years, the study claims that families have been looking for ways to cut costs of raising children, by simply having less of them. Because of this, the ideal family size has gradually decreased.

This shift can actually related directly to tiny architecture, more as an encouragement to the solution of overpopulation, rather than as a solution in itself. What this means is that rather than mobile architecture innately causing people to want fewer children, the people who already want fewer children will be drawn to mobile architecture. If a family is already decreasing their planned size in an attempt to save money, it is not unreasonable to assume that they might turn to mobile architecture in an attempt to increase savings as well. In this way, mobile architecture can rise in popularity for families, and it can cause an increase in the interest of smaller families. In

some extreme cases, it could even be possible that the small area of a mobile home could decrease the preferred family size even further. The idea that preferred family size might decrease is based on studies showing decreased homeownership in American millennial populations, with ages 25-29 showing only 33.3% ownership. This decrease in homeownership is attributed to the increasing debt of college graduates (Peralta, 2014).

In addition to saving money for people raising children, both static and mobile architecture can also save money for a different demographic: the homeless. Even today, there are countless tiny home initiatives to give shelter to the homeless. One example is the Cottages at Hickory Crossing in Dallas, Texas (Sisson, 2015). Nonprofit organizations from around Dallas have come together to transform a three-acre lot into a tiny home community. According to some of the studies that were conducted in the preparation for this



Figure 11: The Cottages in construction in Dallas (Carlyle, 2014).

community, it costs Dallas an average of \$40,000 per year per homeless person. These costs arise from hospital bills for non-emergency uses, jail fees and psychological counseling. The cost for one person living in a tiny home at the Cottages is only \$15,000 per year. This is considerably less than the services that the city would be providing to help the homeless, which amasses to approximately \$40,000 per homeless person per year (Sisson, 2015).

The tiny homes at the Cottages in Dallas are static tiny homes with 400 square feet of living space. This causes both potential issues in the future for the tiny home community as well as some benefits over mobile tiny homes. One problem is that there is not an efficient use of the space on the three-acre lot, with each 400 square foot tiny home being given to one resident. With almost 6,000 homeless in Dallas, alone, efficiency is paramount in the efforts to house homeless people (Sisson, 2015). If mobile architecture was used in place of static tiny homes, the city could provide housing for at least twice as many people for almost no additional cost. This is possible due to the fact that the average mobile home is 200 square feet in area, or 50% of the area of a Cottage at Hickory Crossing. With the average tiny home costing approximately \$250-\$350 per square foot, assuming high-end materials, a mobile home with 200 square feet would cost substantially less than a 400 square foot static tiny home (Carlyle, 2014). A smaller footprint would also enable a faster response time to a homelessness emergency such as the aftermath of hurricane Katrina in New Orleans, when thousands of people were suddenly rendered homeless by a natural disaster. Although there were many relief efforts that took place in an attempt to house the people of New Orleans, they all relied on bringing materials and building there. With mobile architecture, homes could have been quickly built in a fabrication shop and then delivered to the affected people there.

Another potential issue that could arise with a project like the Cottages at Hickory Crossing in Dallas is that as a community of 50 static tiny homes, there is always the threat that the land could be repurposed to another building project. If the government, or the non-profit organizations are unable to continue funding the project, the land could get sold and the tiny homes there would either need to be demolished, or

painstakingly relocated by flat bed trucks. If a development such as the Cottages were to develop using mobile homes, they would not even require consistent land to be staged upon. If the homes could not be kept on the same plot of land, they could be easily moved to any number of different locations ranging from another large site, to even being parking in city-owned parking spots around Dallas.

Some of the potential benefits of using static architecture in this instance include the psychology of the residents in these homes, especially among homeless populations. Having a home to call your own can significantly increase feelings of comfort, and contentedness. For many, however, a tiny home can increase feelings of anxiousness and claustrophobia (Nierenberg, 2015). A static tiny home, particularly one as large as the Cottages in Dallas, can begin to ease the feeling of being closed in and increase the comfort that comes with living in a private residence.

Another benefit of using a static tiny home in a project such as the Cottages in Dallas is the increased sense of community that can be found in the area. Rather than homeless people moving off the streets and into a trailer park of mobile tiny homes, they are moving, instead, into a small neighborhood of tiny homes, enabling residents to begin to make connections around them and stay in one place for a prolonged period of time. A tiny home community can remain together rather than gradually spreading out into other parts of the city, as opposed to if the project had been completed using mobile architecture rather than the static tiny homes.

Although static and mobile tiny homes can serve as a solution to a number of problems in human sustainability, they are particularly adept at addressing the issues of homelessness that can be found specifically in Honolulu, Hawai'i. Tiny architecture as

a whole addresses Honolulu's extreme living costs by reducing the cost of living per person to a more manageable amount. If a tiny home solution were to be implemented, there would not be as many people living on the streets and as a result, the Hawai'ian government would not need to turn away as many people from their temporary housing locations and soup kitchens. A tiny home community in Austin, Texas is estimated to save over \$3 million of tax payer money that would have been applied to homelessness relief programs such as shelters and food (Brooks, 2016). A similar decrease in tax spending has also been observed in other cities that fund tiny home communities for the homeless. With fewer homeless people on the streets of Honolulu, there would be a significant decrease in the needs for mental and physical health services for the psychological and medical issues that are common in homeless populations (Lundhal, 2016).

In this way, tiny architecture serves as a potential solution to the homeless problem in Hawai'i. Both static and mobile architecture could be used to alleviate the issues that cause and result from homelessness in this area. Depending on a number of factors, they both perform either better or worse on different aspects of this issue, . Only by studying previous instances of static and mobile architecture being put into use to solve homelessness, can one or the other be accepted as the most appropriate solution.

Chapter 5: On Case Studies in Tiny Architecture

Tiny architecture is already in use in several areas as a solution to homelessness. From these instances, there are examples of both static tiny homes and mobile tiny homes being constructed. In each case, there are benefits and issues that arise depending on the type of tiny architecture that is used.

The first case study is a mobile project developed as Camp Quixote in Olympia, Washington. Beginning as a protest against homelessness in 2007, Camp Quixote was encouraged to use a local church's land as a point of refuge. Having several homeless, disabled people living on the

church grounds led to the construction of 30 mobile tiny homes at 200 square feet each. Being mobile for Camp Quixote was a necessity, as the homeless community did not have any land on which to permanently live and needed to use church



Figure 12: Quixote Village mobile tiny homes (Lundhal, 2016).

facilities, in addition to their mobile tiny homes, to live. For the first five years of the project, the camp would regularly relocate from church to church, as to not impose on one area for too long. This significantly reduced the consumed land throughout the first five years of the project. In 2013, the camp was allowed to lease a plot of industrial land for \$1.00 per year, a fraction of the usual price (Lundhal, 2016). On the new land, the project was renamed the Quixote Village.

The Quixote village does have a few important drawbacks. The first issue is that the mobile tiny homes on site do not have all of the necessary amenities that are expected in the average house. Instead, there is a common building that has showers, laundry machines, a shared garden space, and a kitchen. These program elements were excluded from the individual mobile homes to maximize the affordability of the project, which was allotted a total of \$2,104,000 in grants from the Washington state government (Lundhal, 2016).

Unfortunately, the static tiny homes of the Quixote Village are relatively expensive to construct. The units cost an estimated \$88,000 for materials, labor, and design for a home with a living space and a bathroom. Although much of the cost is covered by donations, the homes still cost more than a mobile tiny home alternative. (Lundhal, 2016). That puts construction at a total of \$2,640,000 for housing for just 29 people. The Quixote village, however, was able to get the construction labor donated, and the design was provided pro-bono by two architecture firms. They have also relied on donations from other individuals and two Native American tribes.

The second case study project is a static tiny home that was designed by Lon Stousland, Marty Sandberg, and Terry Howell as an entry for the American Institute of Architects tiny homes competition. The static tiny home is 300 square feet of living space with an 8-foot deep outdoor porch. They are designed to be built in



Figure 13: Prototype of winning design in the AIA tiny home competition (Corley, 2016).

a long row to begin making a community of static tiny homes that could be used to provide affordable housing to the homeless population of a city.

This project, unlike the Quixote Village, is designed to include everything that is needed in a small residence. It includes a bedroom, living/kitchen area, and a full bathroom. Due to the larger size of the static tiny home, these amenities are able to be included in the project without significantly sacrificing the livable interior space. It enables residents to live in an area of their own without needing to worry about going to communal, shared areas for their basic living needs. There are, however, some issues that arise in this project. The first and most important issue is the cost, particularly when considering the cost of creating homes for the homeless. With fluctuating market costs, the cost of constructing a tiny home can change drastically. Although there has not been a specific cost associated with this project, the simple fact that it is a larger structure requires more materials and labor for construction. Since it is static, it also makes use of different building materials in the construction of the project that a mobile tiny home wouldn't use. Specifically, this static tiny home was built with a complete brick façade, with wooden framing behind it. Not only are these materials more expensive, they also make the process of moving a tiny home significantly more difficult, in the rare case that a static tiny home needs to be moved (Corley, 2016).

The final case study project connecting human sustainability with tiny architecture is Infinity Village at the Green Street Church of Christ. Reverend Jeff Obamefi Carr and Dwayne A. Jones, a construction worker, founded this initiative in Nashville, Tennessee (Bliss, 2015). Their idea was to make a direct impact on their local community by building 60 square foot mobile homes for the homeless communities in

the area. In preparation for the project, Carr spent 45 days living in a prototype of one of the mobile homes to help him understand what the homes could mean for the homeless community. Carr wanted to be sure that the design for his mobile tiny homes was a viable solution for a

homeless person. The goal of his test was to experience the living conditions of the 60 square foot mobile tiny homes. He determined that the small area of the home was enough to comfortably house the homeless. During his stay in the mobile home, their campaign



Figure 14: Mobile tiny homes are delivered to the Infinity Village (Bliss, 2015).

raised over \$50,000 and construction began. At \$7,500 per unit, the 11-person construction team was able to start building the mobile homes for the homeless community.

The mobile homes that they constructed are modest to say the least. They are composed of one door, one window, and a room in which to sleep. Although it may not be much, these mobile homes provide something to homeless individuals that they have had no access to previously: shelter and privacy. With just these two qualities, it is expected that many of the psychological and physical maladies that are results of homelessness could be alleviated or even prevented all together (Lundhal, 2016). With this initiative, Carr and Jones have presented a way to deal with homelessness in Honolulu that is affordable, effective, and sustainable.

Considering these three examples of tiny homes being implemented as a solution to the problem of homelessness, as well as the Cottages project in Dallas mentioned previously, there are several positives and negatives to consider when deciding between static and mobile architecture. In general the static tiny homes tend to cost more, consume more area on a shared site, and require a more permanent site. They do, however, tend to include more basic necessities for living such as a full bathroom and a kitchen area. This is in contrast to the mobile architecture projects that often lack basic necessities, yet still cost a large amount of money considering that some are little more than a modest shed. Mobile tiny homes are able to be moved easily and therefore do not need a permanent, long-term plot of land to live on. Both static tiny homes and mobile tiny homes have advantages and disadvantages depending on the specifics of the area in which they are implemented.

Chapter 6: Comparative Analysis

In Honolulu, Hawai'i, there are many factors that lead to over 7,000 residents living on the streets. These residents have deteriorated physical health due to drug abuse and assault. They also exhibit numerous mental health issues such as a loss of confidence and increased risk of violence (Hart-Shegos, 1999). Many of these people have become homeless due to the ever-increasing cost of living in Honolulu. Many residents are forced to work several jobs to be able to afford the average \$1,200 per month that it takes to just keep a roof over their head. In response to the growing homelessness problem, the Hawai'ian government has implemented a variety of programs to help the homeless, ranging from providing mental health services, to free airline tickets for those willing to return to their home states. With homelessness still on the rise in Honolulu, the local government needs to begin looking toward the role architecture might play in identifying, developing, and implementing a real solution.

Both static and mobile tiny architecture have the potential to address the issues that are causing homelessness in Hawai'i. Some of the positives that can be achieved through the use of static tiny homes as one potential solution to homelessness include the function of the homes as well as the stability they offer. The function of the homes refers to the increased ability to include all of the necessary amenities in a home without needing to resort to using a communal building. These amenities include kitchens, laundry facilities, showers, and living areas. Due to the larger average square footage of a static tiny home, there more often include these basic necessities that are usually required in a residence. Some of the stability that is offered by a static tiny home takes the form of an increased sense of safety that long-term housing can provide.

Mobile tiny homes lack the same degree of stability due to their mobile nature. A dwelling feels less secure if it changes location regularly (Hart-Shegos, 1999). Studies have also shown that many people will deny basic services to the homeless because citizens naturally want to deny the existence of the homeless. In a psychological study by a professor at Wayne State University, it was found that 60% of people would be willing to pay more taxes for the homeless, but far fewer people would personally help a homeless person (Figuroa, 2013). For this reason it is crucial that the homeless in Hawai'i have access to private kitchens, showers, and living spaces. In this aspect, static tiny homes are more appropriate, as far as amenities, for a solution in Honolulu.

Static tiny homes also provide a higher level of stability than their mobile counterparts. Although both forms of tiny architecture provide the feeling of safety and comfort that comes with owning a home, mobile architecture can often make residents feel too anxious or claustrophobic due to the reduced maximum size. By expanding beyond the mobile average area of 186 square feet, there is a wider range of people who can live comfortably in the home, providing a more universal solution to the diverse population of Honolulu's homeless community.

Mobile tiny homes also have some main positive attributes when considered as a solution to housing Hawai'i's homelessness problem. The architectural solution, however, is not a solution to all of the issues that cause homelessness in Honolulu. It is, instead, a method to help the homeless population begin to escape some of the factors that lead to chronic homelessness. Having a home to live in can lead to both short term and long term recoveries from the causes and effects of homelessness. Many of these communities establish a maximum resident duration in the hopes that the communities

are treated as a transition rather than a solution. They focus on preparing people, who have suffered from homelessness, to regain their independence and rejoin society (Green, 2016).

The two most prominent attributes are the cost and the ability to change location easily. Although it often comes at the price of certain amenities, mobile tiny homes are almost always the more cost-effective solution for homelessness. A team of volunteers could build a bare-minimum homeless mobile home for \$7,500. This structure would, however, be a single room, such as the homes made by Rev. Carr's Infinity Village. Considering the extensive cost of the current projects taking place in Honolulu, which could be reduced if not completely avoided, constructing as many mobile tiny homes as possible might take priority over the construction of fewer, nicer, static tiny homes. If that were the case, then mobile tiny homes would make a far more cost-effective solution than static tiny homes in Honolulu. Honolulu's current zoning regulations, however, are not equipped for a rise in mobile tiny homes within the city. Currently, living in a mobile tiny home in the city would be classified as camping, which is prohibited in the streets ("Homelessness in Hawai'i," 2011). The zoning regulations would need to be altered to classify mobile tiny homes as a separate and distinct residential structure.

There is also the factor of tiny homes being easily moved. As in the Camp Quixote project, the homeless community was able to move from church parking lot to church parking lot before they had a place of permanent residence. Mobile architecture allows a project to immediately begin construction as soon as one location volunteers their space to temporarily accommodate the tiny homes. If a project were completely based

on static tiny homes, there would need to be a large plot of land acquired before construction even began. Considering that Honolulu is a typical bustling capital city, there is no guarantee that there will be enough land available within the city to accommodate a new static tiny home village. If this is the case, then mobile architecture is the correct solution.

Beyond these basic attributes of static and mobile architecture, there are other aspects of tiny architecture that make it an appropriate solution for the current homelessness situation in Hawai'i. Some of these include less consumption of materials, smaller footprint, and less electricity use, which leads to cheaper living cost. Local governments or private donations to the program itself usually cover these living costs associated with tiny architecture as a homeless housing program. These are characteristics that apply both to static and mobile architecture, and both apply to the issues of the homeless community in Hawai'i. Depending on the status of the homeless community of Hawai'i, as well as the status of the local government, both static and mobile architecture hold merit as potential solutions to the problem of homelessness. Static architecture, however, seems to meet the requirements to help a wider range of people as well as help them more. Static tiny homes give more stability to residents since they have a permanent location and surrounding community. The static homes can also provide more of the basic amenities that are expected in a residence, such as showers, living areas, and a kitchen. For these reasons, static architecture makes a strong option for alleviating the homelessness problem in Honolulu, Hawai'i.

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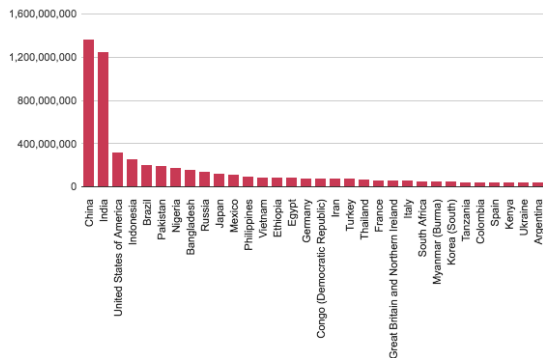


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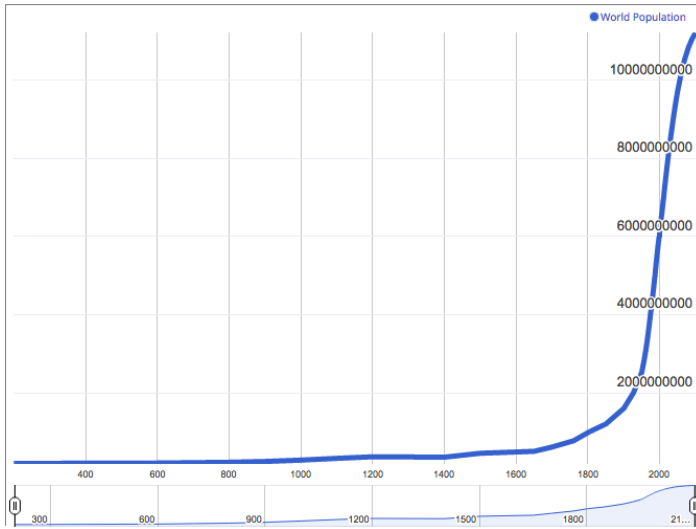


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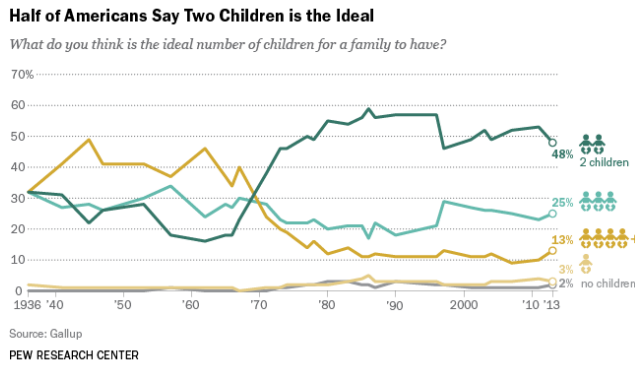


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