

## Sustainable Mobile Tiny Houses

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### Abstract

Some believe that the relatively recent emergence of modern tiny dwellings will provide a solution to the issues of affordable housing and unsustainable development. It is difficult to assess these claims objectively as there isn't a consensus on what defines a compact house. It's unclear if they represent a significant shift or merely a small, specialized housing market. A review of the literature found that living in tiny homes is significantly correlated with having smaller ecological footprints, albeit no research has been able to quantify this as of yet. The research's conclusion makes a strong case for more research into this relationship, pointing out all the benefits that would result from it. Improving tiny house industry practices, potential legislation changes, and an academic contribution to the industry's still-emerging field are among the consequences.

**Keywords:** Tiny houses; subcultures; counter-culture; tiny house movement; housing affordability; environmental impacts; ecological footprints

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### I. Introduction

Carbon dioxide (CO<sub>2</sub>) contaminants is typically produced by homes as a result of energy consumption for appliances, lighting, HVAC systems, and other electrical devices. Buildings have far greater implications for the environment when one takes into account the CO<sub>2</sub> emissions from razing, the production and delivery of building materials, as well as additional construction procedures. tiny housing has been common in most urban settings, from Asia's micro apartments to North America's micro suites to Europe's tiny homes and all points in between. Still, the world was captivated by Jay Shafer's introduction—or rather, reintroduction—of the tiny house on wheels in the late 1990s. Maybe it was a nod to the past era of travel trailers, but more importantly, it was an acknowledgement of a common desire for a simpler lifestyle that was more available economical, and environmentally friendly than traditional housing possibilities.

### II. Literature On Tiny Houses

supposedly the widespread assertions that tiny houses encourage a lower environmental effect, there haven't been many scholarly discussions that go into great detail about this idea (Anson, 2014; Ford & Gomez-Lanier, 2017). Unfortunately, there are presently not any research studies that fully investigate one's changing ecological effects in

connection with decreasing to a tiny home, according to an in-depth examination of the literature on tiny homes that is currently available. Furthermore, no studies have been done to determine the behaviors that contribute to this transformation. To completely analyze a person's ecological impact, all of their behavioral choices, including those regarding nourishment, transport, commodities, and services, must be included. In student investigations, research studies, and academic presentations, affordable housing and its possible effects on one's environment are coming under greater educational review. A student paper (Carlin, 2014) that investigates the potential in theory for tiny homes to lower their residents' carbon footprints calls on future researchers to investigate the ecological advantages of proceeding to a tiny home. For their thesis, a different student investigated the factors that influenced downsizers' decision to live in tiny homes and discovered that environmental concerns were a major motivator. Mutter (2013).

### III. Tiny Houses

In the residential sector, tiny houses are emerging as a possibly workable alternative to prevent wasteful consumption of building materials. Since they prioritize quality across quantity, tiny homes go against present residential patterns (American Chemistry Council, 2015; Ford & Gomez-Lanier, 2017; Turner, 2017; Withers, 2012). A "tiny

home" is generally defined as a functional living space that is typically under 400 square feet and that helps its residents live more fiscally reliable, ecologically conscious, and straightforward existences, nevertheless this definition is not always agreed upon (Campbell, 2015; Small House Society, 2014; Turner, 2017; Vail, 2016).

Susanka and Obolensky (2001) define tiny homes as aesthetically different, individualized dwellings where the owners frequently have a do-it-yourself, creative outlook. Moreover, they are often completely self-sufficient and operational, and have gained notoriety due to television (Bozorg & Miller, 2014; Foreman & Lee, 2005; Vail, 2016). Tiny homes, as opposed to regular dwellings or caravans, usually have a living room, bedroom, the cooking area, restroom, and entrance (Turner, 2017). Additionally, they use higher-quality materials and incorporate more features (Heben, 2014). One can choose to buy a tiny house from a contractor or build their own. According to whose develops it and which facilities it possesses, a tiny house's price may differ significantly (Turner, 2017). There are currently more than 60 firms that construct tiny homes.

#### IV. Tiny Homes And The Environment

Many people have voluntarily downsized to tiny homes in order to reduce the environmental effects of traditional residences and live more sustainably. Due to their smaller tangible footprints, shareholders of tiny homes may be capable to purchase fewer material goods and lessen the strain on the surroundings from both heating and cooling (Askham, 2014; Susanka & Obolensky, 2001; Vail, 2016; Wu & Hyatt, 2016). According to numerous studies (Anson, 2014; Bozorg & Miller, 2014; Turner, 2017; Vail, 2016; Wu & Hyatt, 2016), Tiny houses have a reputation for promoting a lower environmental impact by decreasing consumption from smaller construction square footage, less resources, and renewable energy sources such as solar. No official research has been discovered to support this, though. Actually, several research imply that compact dwelling may unintentionally inhibit some aspects of sustainable living. A few instances involve dining toward a greater number of times due to a lack of preparing food domains, traveling farther due to remote spots relying on some for storage when there aren't sufficient cooling systems or closets, and consuming an excessive amount of electricity when maintaining a tiny home in adverse conditions due to there isn't a basis that regulates temperature (Anson, 2014; Murphy, 2014; Williams, 2014).

minimizing the size of a residence is the most effective way to minimize one's ecological footprint, according to studies released in 2010 by the Oregon Department of Environmental Quality

(DEQ) (DEQ, 2010; Palmeri, 2012). On the whole, smaller homes are more environmentally friendly compared to those with the majority of sustainable home certifications. In Deq (2010). A life cycle assessment (LCA) of the two types of homes revealed that the "extra-small home" (1,149 square feet) had a carbon footprint significantly smaller compared to a typical traditional residence within almost all classifications (which includes the consumption of energy, the manufacture of materials, the construction manipulate, maintenance time frame, demolition stage, and substances shipping). The average home is 2,262 square feet. (Deq, 2010). Furthermore, housing made of recycled materials have far less of an influence on the environment (DEQ, 2010). As a result of its smaller size and proclivity to use recycled materials, tiny homes may have even higher environmental benefits than a 1,149 "extra small home." (Campbell, 2015; Murphy, 2014; Withers, 2012). Although larger homes in the housing industry have historically had adverse environmental impacts, studies in the small-scale housing field may help us better understand how decreasing to a tiny home impacts one's ecological impact. Despite their drawbacks, academic study on small homes has demonstrated that they assist people have a lower impact on the environment.

#### V. Measuring Ecological Footprints

In relation to other statistics that investigate views on environmental harm, the term "footprint" refers to an area-based assessment. (Wiedmann & Minx, 2007; Gossling, Hansson, Horstmeier, & Saggel, 2002). It provides a more comprehensive evaluation of environmental impact compared to these tests. (2018) (Bleys, Defloor, Ootegem, & Verhofstadt). It an individual's, population's, or activity's ecological impact is the quantity of ecologically lucrative land needed for their resource usage. Wackernagel and Rees, 1996; Global Footprint Network, 2018a; Global Footprint Network, 2018b). To determine whether consumption is environmentally conscious, a carbon footprint must be calculated (Gossling et al., 2002). A way to measure an individual's environmental impact that takes into account travel, housing, food, products, and services is called their "carbon footprint." Worldwide hectares is used as the measurement unit. An ecological footprint is a three-dimensional metric which considers economic, environmental, and cultural survival (Martins, Mata, & Costa, 2007). It would be difficult to contrast different combinations of environmental consequences otherwise, but a carbon footprint reduces these effects to a small amount of scale. Individuals who have lived in various types of habitat

can compare how they live right now in a tiny home to their existences in earlier times.

The property types which environmentally damaging tools use to determine the quantity of space required in global hectares (gha) related to agriculture, forests, consuming food, tilting, developed, and extraction of electricity (Global Footprint Network, 2010; Global Footprint Network, 2018b; Kitzes et al., 2007; Moore, Cranston, Reed, & Galli, 2012; Wackernagel & Rees, 1996; Wiedmann & Minx, 2007; Zhao, Heinsch, Nemani, & Running, 2005). A global hectare is equivalent to 10,000 square meters, or 2.471 acres, or about the size of a soccer field, according to the Global Footprint Network's calculations (2018c). According to Global Footprint Network (2010), a resource's global hectares are calculated by dividing the overall quantity by the amount generated for each hectare.

The green footprint calculator is among the most comprehensive analysis of warming temperatures that is accessible right now since it takes into account all of mankind's requirements on Earth, including those related to living conditions, food, transportation, goods, and solutions (Bicknell et al., 1998; Global Footprint Network, 2017; World Wildlife Fund, 2017). The key tool for determining the burden that humans place on the environment of the globe is the ecological footprint calculator, which incorporates components of other well-known sustainable statistics (such as the carbon footprint, water footprints, and broad behavioral scale) (Global Footprint Network, 2018a; Wackernagel & Rees, 1996). An extensive analysis of the effect that humans have on the planet is carried out using a calculator for ecological footprints (Borucke et al., 2012; Cucek, Klemes, & Kravanja, 2012; Global Footprint Network, 2010; Kitzes et al., 2007; Moore et al., 2012).

## VI. Why Are Tiny Houses Becoming More Popular?

One of the biggest and most powerful forces behind the popularity of tiny homes may be economic considerations (Kilman 2016). Customers can purchase a home with a tiny house while saving a lot of money on up-front costs associated with acquiring land (Kilman, 2016). Sustainable development is a different significant motivator. Due to tiny homes promote more sustainable off-grid living, they are often cited as illustrations of a diligent ecological ideology (Anson, 2014; Evans 2018a; Mutter, 2013; Penfold et al., 2018). Finally, but just as importantly, freedom from bankruptcies and the associated commitments of long-term, full-time paid work define a cultural trend that challenges popular expectations of society (Anson, 2014; Boeckermann et al., 2019; Evans, 2019; Mutter, 2013).

### 6-1- Economic considerations

Saving money while keeping a home—albeit a small one—is the "biggest benefit for dwelling tiny" (Kilman, 2016, p. 2). Some may be prepared to build their own tiny house, which would provide them with a "affordable" place to live with no incurring significant debt. The conventional (permanent, built) housing market is becoming increasingly unaffordable for an increasing number of people (Cox & Pavletich, 2018). However, the COVID-19 pandemic (2020) has increased the cost of detached residences, which is expected to exacerbate affordability issues, particularly when coupled with prolonged unemployment and the consequent destitution that a sizable portion of people experiences. Given that they usually spend 60% or more of their income on housing, tenants are more inclined to suffer from housing stress. The problem has gotten worse as a result of the COVID pandemic's surge in home prices and reduced leasing accessibility.

### 6-2-Environmental sustainability

According to many studies (Carlin, 2014; Jones & Kammen, 2011; Saxton, 2019; Shearer & Burton, 2019; Wilson & Boehland, 2008), tiny homes are generally considered to be less harmful to the environment than conventional homes. Tiny homes use comparatively fewer resources than larger homes because of their smaller size, particularly if constructed with recycled materials. Also, the inhabitants of small homes need to think about how they use and possibly dispose of waste as many of them may be off the grid, generate their own electricity, gather rainfall, and use toilets that compost (Anson, 2014; Kilman, 2016; Saxton, 2019). Making sure that the batteries are charged, the garbage toilet is operating properly, and the water tank is full is a requirement for surviving off the grid, which may increase understanding of how to use resources and reduce wasteful consumption (Saxton, 2019). Living in a tiny house could also promote greener behavior; Saxton (2019) found that ecological footprints dropped by roughly 45% after relocation. In addition green activities include using renewable energy, collecting rainwater, using more transit or active transportation, lowering consumption in general, and utilizing less energy (Saxton, 2019). On the other hand, compared to those who live in urban micro apartments, residents of tiny homes in rural areas report driving greater amounts and dining out more frequently (Anson, 2014; Clinton, 2018).

### 6-3- Freedom

Advocates of tiny houses frequently invoke the concept of freedom (Anson, 2014; Bennett, 2019; Boeckermann et al., 2019); however, the term remains imprecise and ill-defined even in these circumstances. It can be used to talk about money matters and the notion that living in a tiny house is a more economical lifestyle. According to Mangold and Zschau (2019), tiny homes are thought to provide opportunities for increased independence from the full-time wage labor needed to save for down payments, mortgage payments, and the arrived "good life" amenities, as well as to free up money for leisure and travel. There are other, more nuanced meanings of liberty that range from the ability to travel around freely to the absence of restrictions to a voluntary simplicity that, in light of the complexity of contemporary life, is almost Thoreauvian (Alexander et al., 2018; Mangold & Zschau, 2019). Despite the fact that proponents of tiny homes frequently use the term, its true significance appears not to be well understood. Tiny home owners frequently face difficult choices regarding things like in which to park ethically, what to do with the waste from their composting toilets, how to handle privacy issues, as well as how to blend in with the rest of the community (Mutter, 2013; Vail, 2016).

## VII. General Recommendations

### 7-1- Planning and Development

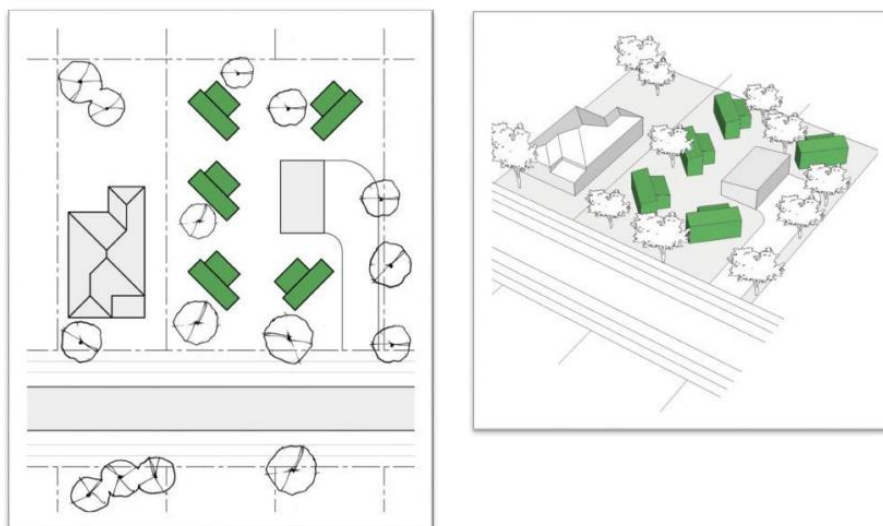
One type that includes transient and long-term housing is the tiny house. Tiny homes can help reduce housing stress and provide a greater variety of affordable housing options. In addition to adding diversity to the housing stock, tiny houses offer a creative and sustainable substitute for conventional home designs. The addition of design and construction guidelines for tiny houses gives the community an opportunity to review, comment on, and provide insight into the scope and character of this type of housing. In along with the length of time that Tiny Houses may occupy any site (as allowed by local laws or organizing demands), municipal governments ought to weigh the layout, neighborhood, and financial results when evaluating planning provisions regarding Tiny Houses.

### 7-2- Building and construction regulations

A tiny space presents unique design challenges. The majority of nations' construction codes do not permit this kind of home, although only modest accommodations would be needed to enable Tiny House producers to create conforming homes. Building certifiers and buyers of tiny houses would then have clarity as a result.

### 7-3- Tiny Villages

The construction of tiny villages, which enable the placement of four to eight tiny houses on the property in a manner akin to medium-density projects (Shearer, H., Bares, V., Pieters, R., Winkle, B., & Meathrel, K. (2018).



**Figure 1:** The development of Tiny Villages. (Shearer, H., Bares, V., Pieters, R., Winkle, B., & Meathrel, K. (2018).

#### 7-4-Tiny Lots

For affordable homes, tiny parcels would provide stability and a longer-term financial framework. In circumstances in which homeowners are unable to afford traditionally sized lots, prospective homeowners can still obtain land and potentially gain economically from the asset by

buying a tiny lot. For lots this size, infrastructure planning would need to pay particular attention to the least displayed density demands. Organizing plans that assisted this kind of growth situation also have to include layout, planning, availability, and particular necessities for construction of housing.

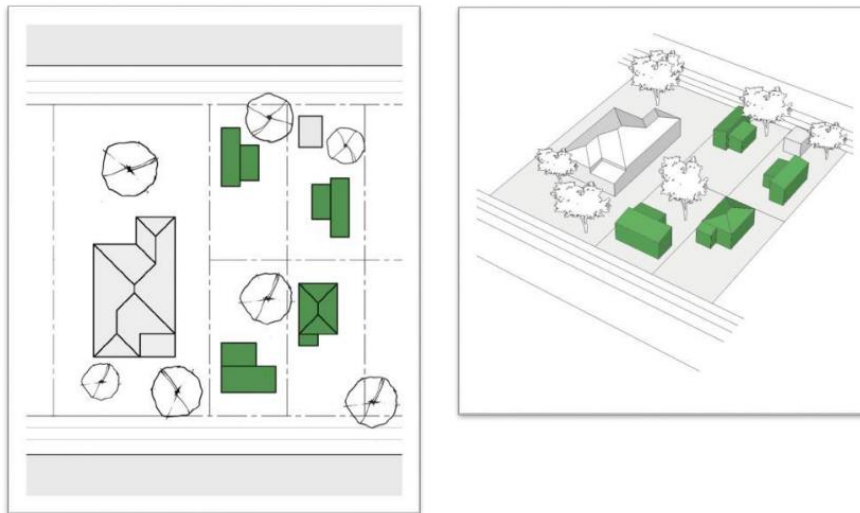


Figure 2 : Tiny Lots would be freehold lots. (Shearer, H., Bares, V., Pieters, R., Winkle, B., & Meathrel, K. (2018).

#### VIII. Conclusion

Lastly, there's a chance that additional study on the connections between tiny homes and other domains like business operations and scholarly contributions will produce important findings.

First and foremost, streamlining the tiny house industry's procedures is essential to guaranteeing that compact homes are built swiftly, sustainably, and in line with safety regulations. By conducting research in this field, we can identify best practices, establish standardized recommendations, and promote industry innovation. Improvements in construction methods, the source of building materials, and energy efficiency may result from this, increasing the viability and appeal of tiny houses for both individuals and communities. Through research and advocacy, we could push for changes to regulations and promote the incorporation of tiny houses in conventional housing policies. This may open up new opportunities for affordable, sustainable housing, as well as diversify the types of homes available and slow down urban sprawl.

Additionally, studies on tiny houses advance our understanding of this still-developing field of study. Scholarly and in-depth research on various aspects of small houses, including their cultural significance, social ramifications, and design challenges, is currently lacking. Undertaking rigorous research will allow us to add new insights,

improve the information base, and contribute to the academic discourse on tiny houses. Eventually, this will help us comprehend their possible advantages and ramifications for the community.

Lastly, there are several benefits to funding tiny house research. It could shape industry norms, pave the way for legislative adjustments, and advance academic knowledge of this emerging field. By utilizing the potential of research, we can further maximize the social, economic, and ecological advantages that tiny houses may offer to people, communities, and society at large.

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