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Energy, Adoption Factors and Urban Policy in Miniaturized Home Use

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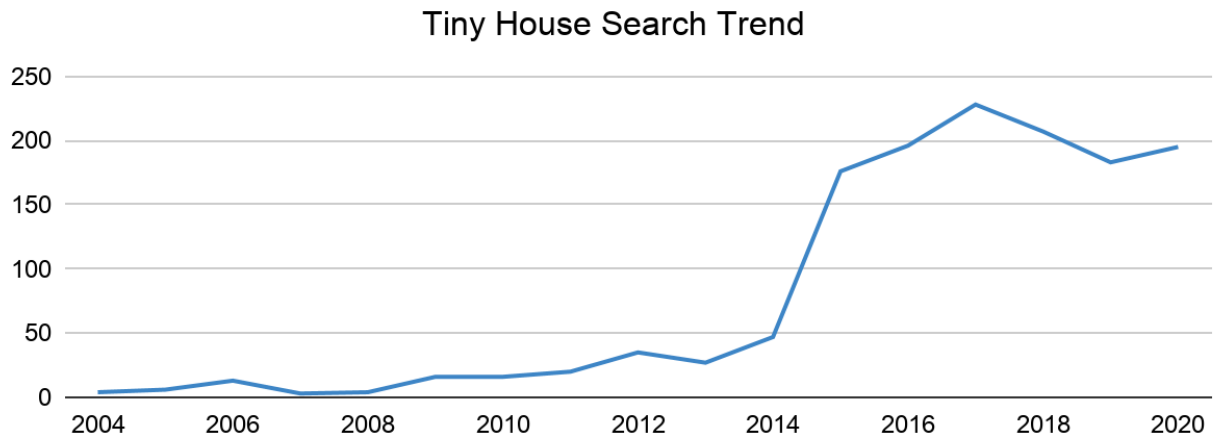
Background

Miniaturized homes — residences that are generally smaller than 1,000 square feet in size — have grown in popularity.[1] A recent survey by the National Association of Home Builders found that more than half of U.S. adults in a representative sample would consider the possibility of buying a tiny home (Quint, 2018). 'Tiny homes' or residences which are even smaller at 400 square feet or less in floor area, excluding lofts (International Residential Code, Appendix Q) are projected to grow by a compounded annual growth rate of 7% in the period between 2020 and 2024 (Global Newswire, 2020). In contrast to a new, single family home in the U.S. which had a median size of 2,301 square feet in 2019 (U.S. Census Bureau, 2020), these downsized houses are seen as having a range of advantages in affordability, energy savings, environmental impacts and simplicity.

[1] Small residences are not new. Cabins, for instance, have been a long tradition. Yet recent developments, including housing crises, such as those in 2009-2011 and 2020, and increased homelessness, make ownership of smaller homes more attractive.



Source: Google Trends[2]

Whether standing alone or constructed in the form of accessory dwelling units (ADUs), such miniaturized homes are not without challenges.[3] Zoning restrictions are a key influence on the favorability of miniaturized homes. This brief examines the energy profile of miniaturized homes, specifically tiny homes and ADUs. Drivers and barriers of adoption are reviewed next. The following section examines urban policy development in two northwestern cities that lead in miniaturized home use. The brief closes with some recommendations.

Energy Profile

Tiny homes and ADUs are widely recognized as a sustainable alternative to urban construction (Carlin, 2014). In the United States, residential energy usage contributes to roughly one-fifth of carbon dioxide emissions (U.S. EIA, 2020). To reduce the carbon footprint, a recent study published in PNAS points to the opportunity with smaller homes to lower per capita floor space, zone in denser settlements, and transition to distributed low-carbon energy sources (Goldstein, Gounaridis, and Newell, 2020). Such homes by design support lower energy consumption and GHG emissions per unit, while reducing utility bills (Palmeri, 2014; Vail, 2016).

Evidence from builders, owners and residents suggests that there is a growing trend with tiny home owners of adopting solar power, energy-efficient appliances and off-the-grid living (Bastek, n.d.; Constellation, 2017). When compared to a traditional single-family home, a tiny house on average, uses only 7-15% of energy (Storgaard, 2019; Harkness, 2019) and 17.5% of average gallons of water per day (Engberg, 2015). Energy efficient tiny homes with a solar-powered blackout shade

[2] This figure provides the aggregated search trends from Google for 'tiny house', 'tiny house for sale' and 'build tiny house' in January of each year between 2004 and 2020.

[3] Accessory dwelling units, also called in-law units, are self-contained housing units located on the property of a single-family home. These units may be part of the existing home in a basement or above a garage, or can be free-standing structures which include a bathroom and a kitchen or kitchenette (Been, Gross, & Infranca, 2014).

prevent 40% heat loss and 60% heat gain within a unit (Ozery, 2015). In a modeled zero-energy tiny home in California, energy use per occupant was calculated to be 50% lower than a standard-sized house (Harkness, 2019). Additionally, green building practices employed in the design of tiny homes lead to an 8-14% reduction in lifecycle costs (Harkness, 2019). Over a 20-year electric system lifespan, a tiny house is estimated to save approximately 100 tons of a carbon dioxide equivalent (Siegner, 2017). Subsequently, the long-term climate change impact of a tiny home is calculated to be 50% less than a standard-sized house (Brown, 2014).

Current Drivers and Barriers

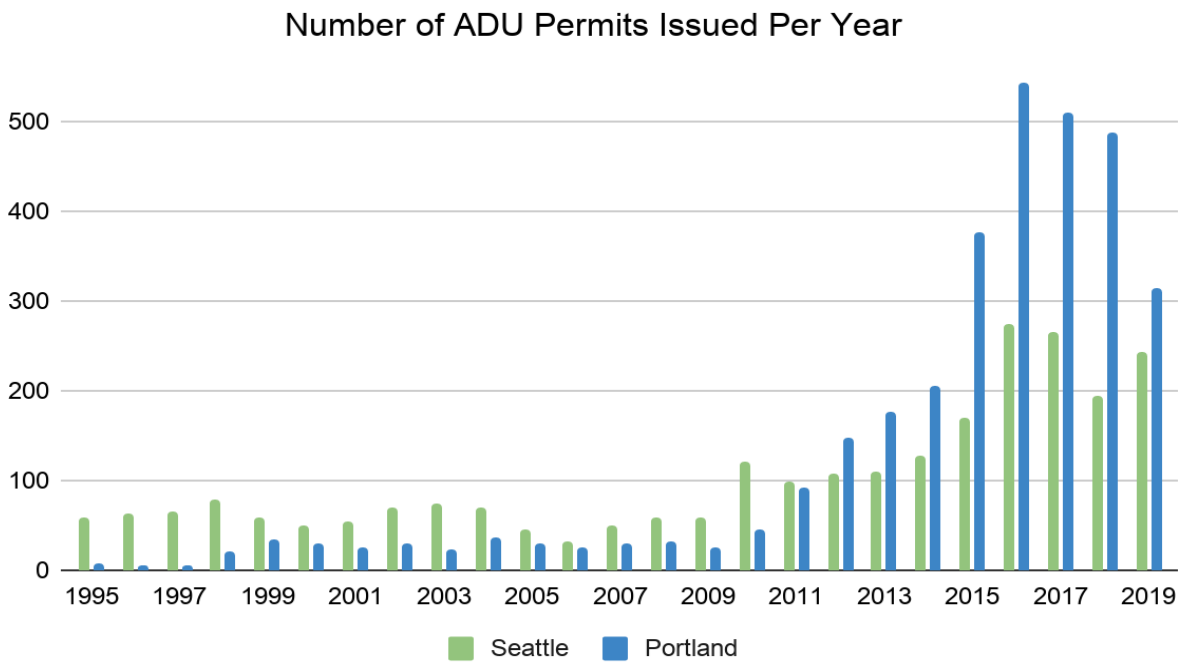
Economic, social and environmental factors are all among the forces at work in the miniaturized home adoption. As affordable housing has become a greater challenge, one of the strongest influences in smaller home adoption is the opportunity to save money (Shearer, 2018). People increasingly prioritize lifestyle simplification and the personal freedom that comes with spending less money on housing (Mangold and Zschau, 2019). Changing ADU and tiny house legislation also reflects evolving family structures in the U.S., stemming from families having less children, more single-parent households, more female wage-earners, a steep increase in one-person households, and more multigenerational households. Tiny houses allow for a much smaller ecological footprint not only because of their size, but also because they tend to be built more efficiently, as noted above, or out of recycled materials (Evans, 2019).

Despite strong drivers, regulatory and economic barriers as well as neighborhood opposition have prevented the widespread adoption of small and tiny homes as an affordable housing strategy. Regulations requiring adherence to zoning ordinances, building codes, permits and fees, create psychological barriers to ADU development (Chapple, Wegmann, Mashhood and Coleman, 2017). Potential developers' and homeowners' efforts to build ADUs are often hindered by caps on building size; parking, height, and setback limitations; and requirements on lot eligibility, owner occupancy, and design/appearance specifications (Anacker and Niedt, 2019). Additional, front-end costs associated with ADU development and difficulties in financing also serve as impediments in a relatively new market for lenders (Infranca, 2014). In a similar vein, limited familiarity with ADUs makes asset valuation and development of insurance coverage difficult for these properties (Evans, 2018). Finally, neighborhood opposition to increased resident density, resistance to change in neighborhood character, and concerns related to straining of local resources, have also acted as barriers in this policy area (Been, Gross, and Infranca, 2014).

Policy Comparison: Portland and Seattle

Recognizing the importance of policy in the adoption of tiny homes, relevant urban planning was examined. Portland, Oregon and Seattle, Washington are two of only four cities in the U.S. with more than 1,000 ADUs (Landrum, 2019). These cities have similar policies for miniature houses. Portland demonstrates slightly advanced policy development by allowing "cottage clusters", groups of four or more homes under 900 square feet, to be built within the urban growth boundary.

Seattle has introduced similar and other tiny house legislation, though it has not been passed yet (SB 5382, 2020; SB 5384, 2020).



Sources: City of Seattle, 2020; Peterson, 2020.

Portland was an early urban lead in this area by developing favorable ADU policies, which included the removal of owner occupancy and parking requirements, waiving system development charges, and relaxing design standards. Seattle has made recent strides in terms of overall ease of the process by allowing for two ADUs to be built on the same lot, changing the maximum square footage requirement of ADUs from 800 square feet (as in Portland) to 1,000 square feet, and creating a website of pre-approved ADU designs. Each of these policy adaptations are intended to speed up the process and reduce costs associated with ADU projects.

Outlook

Future development of tiny homes can be an environmentally friendly and a relatively cost-effective option for improving housing supply in cities. Yet despite documented benefits, public perception and understanding of the miniaturized house movement is fairly limited.

If city planners are considering the prospects of miniaturized homes in their region, a cost-benefit analysis will be important to assess a city's local conditions. Policy tools of relevance may include development incentives and/or rent control. Partnerships with lenders, insurance appraisers, and strong community buy-in will also be crucial for successful development in this area.

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