

# ZONING PRACTICE

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## Climate-Resilient Floating Residences



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# Climate-Resilient Floating Residences

By Meg Byerly Williams, Esq.

Most people are unfamiliar with floating residences other than what is portrayed in the media, such as the floating home in which Tom Hanks' character lives in the classic 1993 movie *Sleepless in Seattle*; however, these residences, which are designed to float in a water body, present a potential opportunity for coastal communities to enhance their resilience in the face of climate change.

The U.S. is home to thousands of floating residences (McPherson 2017), and in other countries, like the Netherlands, developers have begun building amphibious houses that adapt to rising water levels (Climate ADAPT 2023). Because they rise and fall with water, amphibious homes potentially could help communities adapt to flooding, storm surge, and sea level rise associated with climate change. Despite these adaptive benefits, many local governments ban floating residences

or tightly regulate them, making it difficult, if not impossible, to live in a floating house.

This issue of *Zoning Practice* explores the climate-adaptive features of floating residences, describes the different types of floating residences and the regulatory barriers they face, and explains how local jurisdictions typically regulate floating residences. It concludes by suggesting some climate-smart zoning strategies for floating residences and encourages communities to further investigate how they can support these resilient homes.

## The Climate Case for Floating Residences

Floating residences could be a useful strategy to help shoreline communities build resiliency and adapt to climate change. Where built, these homes enable occupants to ride out flooding and storms

*The Schoonschip floating community in Amsterdam, the Netherlands (Credit: Milos Ruzicka, iStock Editorial / Getty Images Plus)*



(Climate ADAPT 2023). Residents of the floating Schoonschip community in Amsterdam, the Netherlands, weathered a significant storm in 2021. “They tied up their bikes and outdoor benches, checked in with neighbors to ensure everyone had enough food and water, and hunkered down as their neighborhood slid up and down its steel foundational pillars, rising along with the water and descending to its original position after the rain subsided” (Rubin 2021).

Although floating residences impact the environment, their effects are minimal. Floating residences may employ foundations that protrude deep into the ground below water and can alter water bodies via silt erosion, like around bridge piers, and impact water flow (Ross and Paddison 2016); however, floating residences also can affect aquatic habitat positively. A recent study found that they have minimal effect on water quality while attracting nesting birds and supporting “lively” underwater ecosystems (Pedroso de Lima, de Graaf-van Dinther, and Boogard 2022).

Floating residences also can ease demand for greenfield development. U.S. Census Bureau projections predict that the U.S. population will grow

from 333 million in 2022 to 361 million in 2050 (2023). Floating residences can help absorb growing demand for housing and can help reduce development pressure in flood-prone inland areas (Climate ADAPT 2023).

Finally, floating residences might be more resource-efficient than land-built homes. The floating houses in Schoonschip are energy- and water-efficient and integrate solar panels, green roofs, and thermal exchangers that use canal water to regulate indoor temperatures (Climate ADAPT 2023). Due to its location in a former manufacturing area of Amsterdam, Schoonschip is a “short ferry ride from central Amsterdam, where many of the residents work” (Rubin 2021). For all of these reasons, floating residences are a strategy U.S. communities could employ to build resiliency and reduce climate impacts.

### **Floating Residence Types**

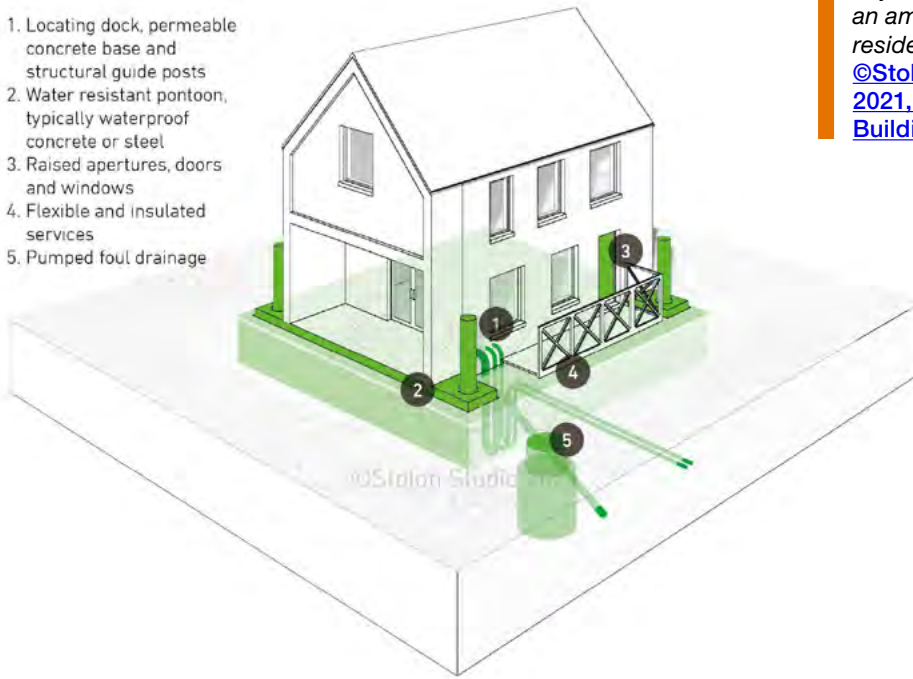
Homes located on water come in different shapes and sizes but generally fall into one of three categories, which sometimes are used interchangeably. *Houseboats* are like RVs. They can be disconnected from on-shore utilities and services and



*Student apartments in Copenhagen, Denmark, built with upcycled shipping containers (Credit: Ole Schwander, iStock Editorial / Getty Images Plus)*

#### Amphibious Construction

1. Locating dock, permeable concrete base and structural guide posts
2. Water resistant pontoon, typically waterproof concrete or steel
3. Raised apertures, doors and windows
4. Flexible and insulated services
5. Pumped foul drainage



Key features of an amphibious residence (Credit: [©Stolton Studios 2021, Designing Buildings Wiki](#))

moved to a new location relatively easily (Zillow 2013), as they have a built-in motor and navigation system. A houseboat's hull is usually constructed from fiberglass, steel, or aluminum, but these vessels typically look more like a house than a boat (Thorsby 2023).

Conversely, *floating homes* are docked in one place, typically among other floating homes, where they are permanently connected to utilities and other services. Floating homes do not have motors or navigation systems and have hulls made of concrete (Thorsby 2023). The hull forms a counterweight, keeping the floating home stable in water (Rubin 2021). Floating homes come in a range of sizes, from small, single-family dwellings to multi-story, multifamily residences (Zillow 2023).

People have been living in houseboats and floating homes since the late 1800s (FLOHOM 2023), but in recent decades, developers have begun building a newer type of floating residence, the amphibious home. *Amphibious homes* look like floating homes but “are stabilized by poles dug roughly 65 meters into the ground and outfitted with shock-absorbent materials to reduce the feeling of movement from nearby waves” (Rubin 2021). The amphibious home is fastened to this mooring post, which limits water-caused motion, and has a concrete foundation (Climate ADAPT

2023). Unlike floating homes that permanently float in water, amphibious homes rest above the water and move upward when the water rises (Climate ADAPT 2023). In this way, amphibious homes adapt to water levels that fluctuate due to flooding, storm surge, and sea level rise.

It is unknown how many floating residences currently exist in the U.S., but many people live in floating homes and houseboats in Florida, Louisiana, Massachusetts, Oregon, South Carolina, Texas, and Washington State (Zillow 2023). In places where floating homes are relatively prevalent, they number from around a few hundred to over a thousand. In 2017, Portland, Oregon, was home to approximately 1,400 floating houses, and at its peak, Seattle boasted around 2,000 floating structures (McPherson 2017).

Amphibious homes exist in the U.S. but are much less common. After Hurricane Katrina, the Make it Right Foundation built almost 100 houses in the Lower Ninth Ward in New Orleans, which flooded during the hurricane, and one of those houses, the “FLOAT House,” is amphibious with a raft-like base that can float vertically along the house's guideposts during floods (Buoyant Foundation 2023). In another Louisiana community, a group of fishermen converted their existing houses to amphibious homes because the homes

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are situated in Raccourici Old River, which is a prime fishing spot located outside the local levee system that is vulnerable to frequent flooding (de Melker 2012). The fishermen fastened steel frames with buoyant material to the underside of existing buildings and attached the frames to vertical guidance posts. In Louisiana, The Buoyant Foundation works to help retrofit other existing homes into amphibious homes (de Melker 2012).

### **Obstacles to Floating Residences**

Despite their climate adaptive promise, floating residences regularly encounter regulatory barriers to their existence. Owners of floating residences struggle to obtain National Flood Insurance Protection (NFIP) for these properties. The Federal Emergency Management Agency (FEMA) “requires that structures in flood-prone areas to be ‘adequately anchored to prevent flotation, collapse, or lateral movement,’” and FEMA has not been involved with amphibious housing in the past (de Melker 2012). FEMA’s stance that amphibious homes (and likely other floating residences) are not eligible for NFIP seems to have limited their development.

Local restrictions also hamper floating residence development. After the passage of local regulations limiting their use, the number of floating homes in Seattle dwindled to approximately 500, with 150 other floating structures (McPherson 2017). In the 1980s, local restrictions on floating homes and houseboats were prevalent on the East Coast as well. At that time, Long Island municipalities in New York began to ban floating homes due to concerns

about “water pollution, loss of property taxes, a blighted scenic coastline, population growth beyond that provided for by planners, and loss of limited space for recreational boaters and commercial fishermen” (Wacker 1984). This trend continued into the 2000s. For example, in 2013, Riverhead, New York, banned new floating homes and house boats on town waterways (Civiletti 2013).

### **Existing Floating Residence Regulations**

Local jurisdictions that allow floating residences weigh multiple planning considerations when regulating these structures. For example, municipalities must consider the effect of floating homes on other water-dependent uses to ensure these homes do not obstruct waterways. Additionally, they must consider how to create secure connections to onsite utilities and services like public transportation, ensure continued adequate public access to the waterfront, and reduce risks from sinking and fire. Floating residences also affect the housing market and could impact short-term rentals within the community.

These planning considerations inform local regulations that control where and how floating residences may be inhabited. Localities that allow floating residences typically require them to meet minimum building standards, as well as construction standards specific to this particular use. Municipalities also often adopt zoning regulations that define and allow floating residences within certain districts if these homes meet required conditions. Other jurisdictions may require floating residence owners to register or license these homes. A few jurisdictions have adopted laws protecting floating homes from rent increases and eviction.

### **Building Codes**

Floating homes “require extra infrastructure and work to connect to the electricity grid and sewer system, with special waterproof cords and pumps needed to link to municipal services on higher ground” (Rubin 2021). Some local jurisdictions use specialized building codes to establish construction and occupancy standards for floating residences.

*Houseboats along  
the shore of South  
Lake Union in  
Seattle (Credit:  
MarkHatfield, E+)*



For example, Alameda, California, adopted standards for floating homes and moorages in its building code that require all floating homes to have a certificate of occupancy and building permit (§13-38). Floating-home applicants must submit a moorage site plan that includes moorage location, dimension, and service details, and moorages must comply with specific access, walkway, off-street parking, garbage disposal, laundry, lavatory, lighting, electrical, sewage disposal, fuel gas piping, fire protection, and open space standards. Additionally, floating homes must be “stable under the action of dead and live loads” (§13-38.16), must take into effect off-center loading and wind loading, and must be designed using accepted basic engineering principles. Additional standards regulate flotation devices that keep the home afloat, electrical wiring and service, plumbing, inboard sewerage devices, fuel gas piping, room sizes, ceiling heights, building height, framing, exit facilities, guard rails, fire protection, and life-saving equipment.

Fort Lauderdale, Florida, requires floating homes to meet similar requirements, as well as minimum housing standards (§9-176 et seq.). The city’s floating home building standards include water distribution requirements that “regulate[] water service and piping systems and include[] requirements for water supply connections and backflow prevention,” as well as requirements for connections to public streets (§9-221). Marin County, California’s regulations for the construction and maintenance of floating homes include material requirements for decking, siding, and subflooring; require the use of diaphragm walls in flooring, walls, and flotation devices; and mandate the use of an inboard sewerage and graywater device (§19.18). Marin County also requires floating homes to provide a disconnecting means, branch circuit protective equipment, grounding of metal parts, and calculations by a qualified engineer showing that the floating home’s stability conforms to requirements.

### Zoning Standards

Some local jurisdictions restrict the use, placement, and dimensions of floating homes in their zoning regulations. Fort Lauderdale adopted accessory use regulations for floating homes that permit floating homes in municipal dock areas; licensed commercial marinas located in certain public purpose, business, and mixed-use zones; licensed yacht clubs; and waterways adjacent to property in certain business and mixed-use zones ([§47-19.6](#)). A floating home in Fort Lauderdale must have at least one off-street parking spot and cannot block more than 30 percent of the waterway. Additionally, the zoning district density limitations applicable to adjacent real property cannot be exceeded in residential areas. Fort Lauderdale prohibits habitation on floating homes if these requirements are not met.

Marin County includes standards for floating home marinas in the county's zoning code ([§22.32.070](#)). These standards allow certain accessory uses like laundries, dry cleaning facilities, and storage facilities in small marinas and allow convenience stores and doctor/dental services as accessory uses in large marinas. In addition, at least 50 percent of total water area proposed for floating home marinas

must be open water, and there must be at least six to 10 feet between floating homes, a minimum fairway width of 35 feet, and only one dwelling unit per vessel. Marinas must have access to on-land public transportation and retail, must be compatible with the view of the area, cannot create adverse effects on surrounding communities, and must protect habitat and water quality. Finally, marinas must adhere to a minimum density of no more than 10 vessels per acre.

Additional zoning requirements for floating homes may include design and access standards or registration requirements. Sausalito, California, adopted specific use requirements that require houseboats to have a compatible scale to recreational boats and other houseboats nearby; rooflines designed to visually reduce boat's hulk, such as curved, sloped, articulated roof lines; and architectural details to "enhance character" and eliminate a "box-like appearance," including eaves, bay windows, and decks ([§10.44.160](#)). Sausalito's view and water access standards require houseboat placement that preserves existing water views, privacy, and sunlight for adjacent homes. Seattle adopted specific use standards that

*Homes floating  
on San Francisco  
Bay in Sausalito,  
California (Credit:  
Yingchao Teng,  
iStock / Getty  
Images Plus)*



require floating home owners to obtain and display a “registration number on the landward side of the floating home in numbers at least three inches high in a location legible from the pier, or if public access to the pier is not available, then on a side visible from the water” ([§23.60A.202](#)).

### Special Zoning Districts

Other jurisdictions control the placement of floating homes by adopting special-purpose zoning districts. Amityville, New York, adopted a floating home district and requires all floating homes to be located on private land within this zone ([§183-115 et seq.](#)). Only one-family dwellings are permitted, and the district’s bulk and area requirements restrict floating homes to no more than 21 feet high measured from the waterline, with a minimum underwater lot of 7,500 square feet, a maximum building area of 25 percent of the underwater lot area, a minimum distance of five feet between the pier/bulkhead line and front wall of the floating home, and a minimum distance of 24 feet of open water space between adjacent floating homes. In addition, each floating home must have a minimum of two paved off-street parking spaces. Developers may apply to have a floating home district created and mapped

on the village’s zoning map. The Town of Babylon, New York, adopted an almost identical floating home zoning district that also prohibits the use of floating homes for a business or profession ([§203-107](#)).

### Licensing/Permitting Standards

Some localities adopt licensing or permitting standards for floating homes that address site requirements and operational characteristics to control the placement and occupancy of floating residences. For example, Saugatuck, Michigan, adopted regulations that establish a process to license floating homes and their moorages ([§99](#)). In Saugatuck, owners must apply for a floating home license and pay a fee. When issuing a license, the enforcing officer considers whether the floating home and moorage meet all code requirements, are safe and sanitary, are compatible with the surrounding land-use pattern and normal area wave and water patterns, and will need extension/expansion of public facilities and services. The enforcing officer may attach reasonable conditions to approved licenses, such as requiring a specific location or placement and stabilization equipment, and may inspect the licensed floating home. Saugatuck’s floating home regulations forbid location



*Floating residences along the waterfront in Portland, Oregon (Credit: 4nadia, iStock / Getty Images Plus)*

**Homeowners in coastal communities likely will remain reluctant to adopt floating residence technology, especially amphibious homes, if these homes remain ineligible for NFIP insurance.**

in waters adjacent to residential zones, licensed street ends, or city parks.

Winthrop, Massachusetts, adopted regulations that require houseboat marina operators to obtain a special permit (§12.33). Applicants must submit a fee and site plan showing the proposed marina's location and facilities, including each houseboat dock, slip, or mooring and, for each anticipated houseboat, a permanent water supply with an individual backflow prevention valve, a sewer connection leading into a permanent sewer, a permanent supply of electricity and water, and any wastewater disposal facility. These regulations also require houseboats to secure occupancy permits and comply with minimum standards, such as providing interior space of at least 150 square feet for the first occupant and no less than 100 square feet for each additional occupant.

#### **Owner/Resident Protections**

Finally, some local jurisdictions adopt special protections to prevent exorbitant rent increases for or sudden evictions from floating homes. Egg Harbor Township, New Jersey, adopted rent review regulations that protect tenants, including those who live in floating homes, from rent increases and surcharges (§180). These regulations created Egg Harbor's Rent Review Board and authorized it to adjudicate applications from landlords for rent increases, consider landlord/tenant agreements for increased rents, and hear tenant objections to rent increases and applications for reduced rent. Landlords must use a special method for calculating a tax surcharge or capital improvement surcharge for floating homes.

Seattle adopted consumer protection regulations for floating home moorages

“to protect[] the stability, viability, and fiscal integrity of Seattle's unique floating home communities by preventing the eviction of floating homes from their moorages through arbitrary actions and unreasonable rent increases . . . .” (§7.20). Under these regulations, moorage owners may only give notice to remove a floating home for failure to pay a moorage fee, to comply with reasonable terms and conditions of occupancy, or to abate a nuisance. Under these circumstances, the moorage owner must give the floating home owner or tenant at least six-months written notice from the demanded date of removal, and the notice must state the reason for eviction. The regulations forbid moorage owners from retaliating against a floating home owner or tenant due to that party's good faith exercise of their legal rights. The regulations also require 30-days' notice for any moorage fee increases and grant moorage-site lessees the right to file a collective petition for review of certain fee increases. In these cases, a hearing examiner determines whether the fee increase is necessary to assure a fair and reasonable return for the moorage owner.

#### **Climate-Smart Regulatory Strategies**

Although some local jurisdictions allow and regulate for floating residences, most coastal communities do not. Changes must be made to both federal and local policy and regulations to harness the full climate adaptive and resilient potential of floating residences.

#### **Advocate for NFIP Insurance for Floating Residences**

Homeowners in coastal communities likely will remain reluctant to adopt floating residence technology, especially amphibious homes, if these homes remain ineligible for NFIP insurance. NFIP provides flood insurance to residents of participating communities that meet minimum NFIP criteria by adopting a floodplain management ordinance (FEMA 2023). Residents of participating communities are eligible to receive flood insurance for properties located above the Base Flood Elevation, which is outlined on NFIP flood maps. In the past, NFIP has not recognized floating

Coastal homes  
in Port Bolivar,  
Texas (Credit:  
felimizioznikov,  
iStock / Getty  
Images Plus)



residences, curtailing efforts to build amphibious homes in coastal communities (de Melker 2012). To remove this barrier, NFIP regulations and policy should be revised to make amphibious and other floating residences explicitly eligible for flood insurance and to even incentivize these technologies. Without this change, floating residence development will remain hampered, as coastal homeowners in NFIP participating communities must consider what offers better protection: (1) a floating residence with a greater chance of avoiding flood damage but without flood insurance or (2) a traditional house that is more vulnerable to flooding but that can access flood insurance reimbursements. In the absence of regulatory change, only the latter option guarantees financial security despite its greater risk of flood damage.

### **Amend Local Building Codes to Accommodate Floating Residences**

In addition to advocating for NFIP changes, where authorized by state law, local jurisdictions also should amend their building codes to facilitate floating residences. To ensure the safety and welfare of the community, building code requirements for floating residences may need to address moorage location, dimension, and service; unit identification; connections to public streets; utility connections; waste disposal; fire protection; stability and loading; construction materials;

guard rails; exit facilities; and life-saving equipment, among other appropriate factors. Building codes also should include appropriate construction standards for amphibious homes to ensure these residences have sound and safe floating foundations, guidance posts, and up/down systems. Additionally, local governments should amend building codes to enable retrofits of existing traditional housing into floating residences. Where it is a concern, municipalities should consider adopting registration requirements to help address future property maintenance issues. To enhance sustainability, building code requirements for floating residences can include standards requiring thermal exchanges that use water to regulate indoor temperatures, energy-efficient appliances/targets, water-efficient plumbing, integrated renewable energy systems, and green roofs, among other green technologies.

Coastal communities that currently regulate floating residences should examine their existing building code requirements to determine where these standards could be loosened, as appropriate, to make it easier for homeowners to construct and own floating residences. Where local conditions require it, a complex regulatory framework may be needed to ensure public welfare and safety, but in other locations, this is not necessary. Wherever possible, municipalities should take a more streamlined approach, only

adding the regulatory standards needed to keep the community safe. Sitka, Alaska, takes a streamlined approach to the regulation of floating residences, requiring them to meet minimum standards of the International Residential Code, as well as a handful of additional standards relevant to floating residences, like mooring, floatation stability, buoyancy criteria, fire safety, and emergency exits ([§19.15](#)).

### **Amend Zoning to Allow Floating Residences**

Additionally, floating residences cannot proliferate without modifications to local zoning laws. Where not currently allowed, coastal localities should begin by removing any existing bans on floating residences. To permit and regulate floating residences, local governments should amend the definitions section of the zoning code to define the floating residences the community wishes to allow. Municipalities take different approaches to defining these structures, sometimes delineating between the different types and sometimes combining them into one term. For example, zoning definitions for *floating homes* often include houseboats. When making this determination, municipalities should think through the planning

considerations associated with each type of floating residence and the extent to which these uses require different regulatory approaches. If the anticipated floating residences share similar features and safety concerns, a single defined term may suffice, but if their safety and service requirements are significantly different, a more discrete typology is appropriate. For instance, vertical movement along guideposts likely warrants a separate zoning definition and treatment for amphibious homes. If multi-unit floating residences will be allowed, the municipality should adopt an applicable zoning definition for this use as well.

Municipalities also should allow floating residences in appropriate zoning districts by amending the use regulations for those zones to permit defined floating residences and marinas as-of-right. Due to local circumstances, it might be necessary to confine floating residences to marinas, but where possible, municipalities should amend appropriate use regulations to allow scattered-site floating residences, especially near on-land public transportation and commercial centers where residents can access food and community-serving retail. Additionally, local jurisdictions should amend use regulations

*A village of floating homes at Fisherman's Wharf in Victoria, British Columbia (Credit: Roman\_Makedonsky, iStock / Getty Images Plus)*





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to allow floating residences as multi-unit structures and accessory dwelling units (ADUs) where possible.

To ensure appropriate scale of development, municipalities also should amend the zoning code to include suitable density and bulk and area requirements for permitted floating residences. Typical dimensional requirements include minimum distances between vessels (requiring more space for multi-unit residences), minimum fairway widths, and minimum development densities compatible with the surrounding area. Additional zoning requirements for floating residences should protect public waterfront access, allow residences to block only a small portion of the waterway, and, where needed, require a scale and design that is compatible with the surrounding neighborhood.

Municipalities can further modify zoning to make floating residences more sustainable and climate-adaptive by adopting standards that limit impacts on aquatic habitat and water quality; protect the area's waterfront viewshed and sunlight for adjacent homes; allow accessory uses like laundries and personal services retail; and eliminate or reduce off-street parking requirements for floating residence locations that are within walking distance of commercial services and that have access to on-street or shared parking.

### Consider Other Related Local Regulations

When embarking on a local process to facilitate floating residences, municipalities should consider these changes in the context of their existing local regulatory framework to determine whether other local laws and policies will interact with or be impacted by the introduction of floating residences. Where necessary, local jurisdictions should modify these laws and policies accordingly. For example, floating residence owners may seek to turn these vessels into short-term rentals,

which could have additional impacts on surrounding neighborhoods. Municipalities may want to adopt short-term rental provisions for floating residences or modify existing short-term rental laws to address this use.

### Conclusions

Floating residences are climate adaptive. They can weather flooding, storm surge, and sea level rise without incurring damage, are associated with minimal environmental impacts, and can be implemented in a resource- and energy-efficient manner that further helps to reduce climate impacts.

Multiple types of floating residences exist, including houseboats with navigation systems, stationary floating homes, and amphibious homes that can move vertically with rising water. Despite their resiliency, floating residences are relatively rare in the U.S. They currently are ineligible for NFIP flood insurance, and many jurisdictions ban them or possibly overregulate them.

To facilitate floating residences, local jurisdictions must amend their zoning codes to define and allow them in appropriate zoning districts with appropriate dimensional requirements and (where possible) must amend their building codes to ensure sound and safe construction and mooring of floating residences. However, municipalities should only regulate floating residences to the extent necessary to ensure public health, safety, and welfare and should advocate for the extension of flood insurance to floating residences. The exact approach each jurisdiction should take will vary due to local circumstances, but as more communities facilitate climate adaptive floating residences, planners will likely identify more specific recommendations for how to best regulate floating residences.

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**American Planning Association**

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**ZONING PRACTICE** FEBRUARY 2024 | VOL. 41, NO. 2. Zoning Practice (ISSN 1548-0135) is a monthly publication of the American Planning Association. Joel Albizo, FASAE, CAE, Chief Executive Officer; Petra Hurtado, PHD, Research Director; David Morley, AICP, Editor. Subscriptions are available for \$65 (individuals) and \$120 (organizations). © 2024 by the American Planning Association, 205 N. Michigan Ave., Suite 1200, Chicago, IL 60601-5927; [planning.org](http://planning.org). All rights reserved. No part of this publication may be reproduced or utilized in any form or by any means without permission in writing from APA.