Current Opinion
CO 4 (4), 766– 777 (2024)
Received 20 April 2024 | **Revised 22 May** 2024 | **Accepted 18 June** 2024 | **Online Available 25 July** 2024

https://doi.org/10.52845/currentopinion.v4i4.318

Current Opinion
Current Opinion

OPEN ACCESS

ISSN(O)2795-8639

ORIGINAL ARTICLE

"Innovative Sustainable Architecture: A Lesson Learned from Amphibious House in the UK"

Sajjad Naseri[1] | Sanli Eshraghi[2] | Shima Talebian[3]

[1]M.Eng. Department of Civil, Chemical, Environmental, and Materials Engineering - DICAM Alma Mater Studiorum - Università di Bologna, Italy

[2]Department of Geomorphology, Faculty of Planning and Environmental Sciences, University of Tabriz, Tabriz, Iran

[3]Department of Interior Architecture, University of North Carolina at Greensboro (UNCG), Greensboro, NC 27412, United States

Corresponding Author: Sajjad Naseri

Abstract:
The article discusses sustainable building practices and the operation of the UK's Amphibious House. The house can go up and down in response to rising or falling water levels during flood events. It includes certain features such as systems for renewable energy and materials specifically designed to keep it sturdy during floods. The house be a good example for how to live in places where floods happen. Its design helps to deal with floods and also uses energy-saving stuff like solar panels and geothermal heat pumps and heat recovery systems. This paper looks closely at the design and the materials and the good things it does for the environment. The Amphibious House shows how sustainable architecture can deal with climate change and make cities stronger.

Keywords: Sustainable Architecture, Flood Resilience, Amphibious House, Climate Adaptation, Energy Efficiency, Water Management, Community Resilience, Buoyant Foundation, Renewable Energy Systems, Architectural Innovation.

Introduction

Buildings need to be stronger and more environmentally friendly and as climate change gets worse and extreme weather occurs more frequently creative architectural solutions are needed. One excellent illustration of this is the Amphibious House. This home designed by Baca Architects shows how environmentally friendly building practices and flood protection may coexist. This provides a high bar for future building in flood-prone areas.

Understanding how to make cities more sustainable and develop long-term systems is essential. This requires approaching urban science in a way that connects everything together. The goal is to create urban regions that are resilient, equitable and adaptive to changing climates. When sustainable design is integrated into urban planning and construction can make big differences like saving energy and cutting carbon emissions that making cities tougher against challenges [1].

Amphibious home is an effective approach to deal with flooding. They have floating foundations when water arrives, the home just floats. This keeps people safe and prevents a lot of damage to properties. Including amphibious design in city planning helps strengthen communities and prepare them for the larger and more frequent floods that are becoming more common as a result of climate change [2].

In addition, using green supply chain concepts is important for making buildings more eco-friendly and sustainable. Zarean Dowlat Abadi and colleagues published a research that found making better judgements about where to keep products and how to move them around can decrease environmental impact while improving supply chain efficiency [3]. This kind of thinking influences how we design to manage logistics and care for the environment which is resulting in more durable and efficient buildings.

Research shows that combining smart design with environmentally friendly practices is essential. Reviews of these houses shows that they not only lower flood concerns, but also make homes more environmentally friendly. These elements have performed effectively in a variety of projects which shows amphibious house can be a good solution for flood-prone locations and emphasizing the need of using them in the design of sustainable structures [4].

The Amphibious House is more than just a flood-proof home. It’s a great example of sustainable living condition too. The houses uses solar panels for clean energy that also has systems to collect rainwater and uses energy-saving appliances. These systems helps lower down its carbon footprint and save energy. The materials used to build it are also eco-friendly like timber from nearby and insulation that’s good for the environment. This makes the house last longer and have less impact on nature.

This house isn’t just about dealing with floods. It shows a commitment to being green and taking care of the planet. The Amphibious House opens the door for more designs that can handle climate change and help protect communities in flood risky areas. It’s an example of how architecture can change to face the challenges of the world fast-changing climate while keeping sustainability and strength in the future.

1. Methodology and Data

This paper analyzes a comprehensive case study approach to evaluate the Amphibious House. It is focusing on its design and sustainability features and also community impact which is essential. Data were collected through architectural documentation and technical specifications. The analysis includes reviewing relevant literature on sustainable architecture and also flood resilience. To add more, new resources that understand the Amphibious House's contributions to various fields are being reviewed. Furthermore, statistics on energy efficiency, environmental impact, and even community input were analyzed to determine the success of the house's design in everyday situations. This strategy allows for a complete knowledge of the house's role in improving sustainable and resilient design.

2. Overview of Sustainability in Architecture

Sustainable design helps to reduce its environmental effect and improve energy efficiency to keep buildings withstand the effects of climate change. With climate change causing more floods and other disasters, it is really important to discover innovative methods to design buildings that keep populations safe.

Flood-proof construction are important because climate change result in floods to occur more frequently and with increasing intensity. Houses that can float or survive in the flood times saves lives while lowering the financial and environmental costs of flood damage.

Amphibious House is an excellent example of how to live sustainably in flood-prone areas. This article looks at how the house is designed and what impact it has to give a deep look into how this type of architecture can be both green and strong.

3. Literature Review

Sustainable architecture focuses on cutting down environmental harm to boost energy efficiency which is helping buildings stay strong against climate risks. Finding new building designs that support community strength with climate change which is causing more floods and disasters is more important than before.

How subcultures and architecture interact can really shape social and environmental outcomes. Knowing how different social groups react to and accept new architectural ideas is key for making things sustainable. A study by Ghorashi and others shows how important subcultures are in making new architecture like the Amphibious House work. They point out that you need to think about local culture and social issues to make sure they fit in well and succeed when bringing new designs and technology to have a good impact on people [5].

Zen art, for example, emphasises harmony and balance, which has a strong impact on architecture by combining natural materials with especially designed space to create a sense of peace and attention. This approach is consistent with sustainable design which seeks to create environments that are in harmony with nature. Sustainable designs focus on making buildings that look good and are well adopted to the environment at the same time and it is like Zen principles seek to balance everything in a peaceful way [6].

Technology play an important part in changing our perception of sustainability in building. Developing new materials and systems is essential to achieving environmental objectives. When architects mix cutting-edge technology with time-honoured design principles, they may create structures that not only satisfy today's green building regulations but also surpass our expectations of what was feasible in terms of eco-friendly construction. By combining the old with the new, this architectural style pushes the boundaries of sustainable design and produces creative and environmentally friendly buildings [7].

Different ways to achieve sustainable architecture like saving energy and using eco-friendly materials which is very important and finally coming up with new design ideas are essential. Using these techniques in different ways shows how important it is to take a view of sustainability that looks at both the environment and social aspect. Architects are able to design structures that are both environmentally friendly and well-suited to the communities they serve. This strategy guarantees that sustainability is feasible and significant in all situations [8].

A deep analyses of sustainable architecture covers important ideas and principles and examples. This resource shows how sustainable design has developed over time and how environmental factors are now a big part of architectural choices. It offers useful ideas about the latest trends to help to understand how current practices have evolved and how they shape modern architecture [9].

renewable resources. It offers important trends for designing buildings that use energy efficiency and includes details on technologies and methods to cut down on energy use to save resources and improving eco-firendly techniques. This manual is key for putting sustainable energy practices into action and helping architects create buildings that are both eco-friendly and efficient in terms of environmentally friendly [10].

The link between sustainable architecture and urbanism looks at ideas and technologies and some examples from all over the world. it offers a wide view of how to apply sustainable practices in various settings by exploring how green design can be used in both individual buildings and entire urban areas. This idea help to understand how to make both buildings and cities more eco-friendly and adaptable to different needs and environments [11].

A case study of the Greentainer project showcases sustainable architecture through its creative design and materials. The project shows a sucessful option in energy efficiency and saving resources which are really important nowadays and also it is reducing environmental impact. It provides real-world examples and practical ideas for applying green principles in actual projects to make it a valuable reference for sustainable building practices [12].

Sustainable architecture design and housing focus on including environmental factors in the design process and exploring different ways to achieve sustainability in homes. This work offers important insights into how design can support and enhance sustainability which shows how thoughtful planning and innovative approaches contribute to more eco-friendly and efficient living spaces in the world [13].

A critical history and survey of modern sustainable architecture and urban design looks at how sustainable practices have evolved and how different designs affect the environment and society. This detailed review provides an important perspective on how sustainable architecture is developing and how it influences the built environment. it highlights the role in creating more eco-friendly and socially responsible spaces [14].

This project has become a key solution for dealing with climate change and the growing risk of floods. Studies on flood resilience show how buildings and institutions can be designed to adapt to and lessen the effects of flooding especially in dangerous area. Effective flood resilience needs both adaptable building designs and proactive measures from institutions. we can greatly improve how cities handle floods by combining advanced engineering with careful planning. From various case studies, it's clear that the success of amphibious housing and similar solutions depends on both the technical design and the coordination between building systems and institutional frameworks. This all-encompassing approach makes sure that both the structures and the community systems are ready for severe weather conditions and rising sea levels [15].

4. Background and Concept

The growing dangers of flood and rising sea levels led to the development of the Amphibious House. Baca Architects imagined a house that might float during floods. It is safeguarding the environment to minimize harm and encourage environmental sustainability.

Key contributors to the project include:

- **Richard Coutts,** the head of Baca Architects, was in charge of the entire concept and vision.
- **Technician:** Offered solutions related to structural engineering.
- **HR Wallingford's:** Provided experience in hydrological engineering.
- **Daikin:** Electrical and mechanical systems were managed.
- **NRJ Project Management:** Integrated duties related to project management.

Table 1: Key Stakeholders and Their Roles

Stakeholder	Role and Contribution
Baca Architects	Design and overall vision
Techniker	Structural engineering
HR Wallingfords	Hydrological engineering
Daikin	Mechanical and electrical systems
NRJ Project Management	Project coordination and management

The main goals were to build a home that could withstand floods and reduce environmental harm. They have creative design and eco-friendly materials. Their project helped to serve as a model for sustainable development in flood-prone areas.

5. Design Features and Innovations

Heat management is required for maintaining temperature control and ensuring efficiency in high-power wireless EV charging. Phase change materials (PCMs) and hybrid PCM-heat sinks are solutions for dissipating heat while retaining thermal stability. Using PCMs, these systems may collect and release thermal energy while charging, reducing temperature fluctuations and improving performance [16]. Analytical and numerical modeling is important for fine-tuning PCM-based heat management systems. It provides valuable insights into how heat moves and how materials behave to help optimizing designs and setup.

Additive manufacturing of functionally graded materials (FGMs) uses machine learning to make big strides in material science. Improving layer deposition accuracy and material property prediction lead machine learning algorithms help to optimisation of the fabrication process. This problem leads to improved mechanical performance and decreased material waste. These advancements result in more durable and efficient structural elements as well as environmentally friendly production techniques [17].

Using multiwalled carbon nanotubes (MWCNTs) in composite materials like glass/epoxy laminates has led to big performance under dynamic loads. The thickness of these MWCNT-reinforced composites is key to boosting their mechanical properties which is resulting in improved resilience and durability [18].

Microchannel heat exchangers have become important for improving energy efficiency and thermal management in sustainable architecture. Their compact size and excellent heat transfer abilities make them perfect for many industrial and energy uses. Computational modeling, along with detailed experimental validation is also a key to fine-tuning their design and performance [19]. Experimental validation confirms that computational models are accurate which is proving that iterative design improvements and new heat transfer techniques work effectively. This process ensures that the predictions made by models are reliable and that the enhancements lead to real improvements in performance.

Expanded polystyrene is used to create a buoyant foundation for the amphibious house. The home is supported by vertical guides and floats with rising floods with this configuration. This design maintains the home steady and stops it from leaning or sliding during flood. (Fig 1.1).

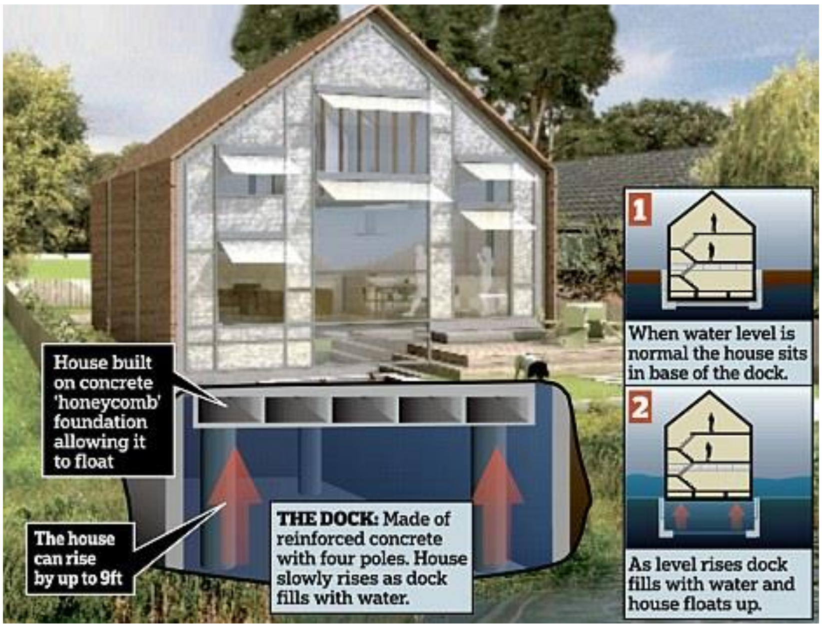

Figure 1.1: Flood-resilient design of Amphibious House. Source: [20].

Table 2: Key Design Features of the Amphibious House

Feature	**Description**
Buoyant Foundation	Made from expanded polystyrene to allow floating
Vertical Guides	Stabilize the house during floods
Flood-Tolerant Terraces	Manage water levels and act as natural flood defenses
Water-Resistant Materials	Prevent water damage to structural components

This House features terraces that act as natural flood defenses and early warning systems. Its lower level has water-absorbent plants that help manage floods and filter water.

The house uses locally sourced timber and glass which are both durable and low-maintenance. These material help lower the building's carbon footprint and support long-term sustainability which are environmentally friendly.

It is equipped with solar panels and a mechanical ventilation heat recovery system. It also has a geothermal heat pump. These features cut down on the use of non-renewable energy and reduce operational costs to boost the house's energy efficiency.

The house also explores new living ideas. The "rocking the houseboat" concept mix the buoyant nature of houseboats with advanced architectural designs. it is not only improves flood resilience but also offers a fresh way to blend living spaces with natural water bodies to create a seamless interaction between homes and the environment [21].

6. Energy-Efficient Systems in the Amphibious House

The house has solar panels a mechanical ventilation and also heat recovery system and a geothermal heat pump. These systems help cut down on using non-renewable energy and lower running costs which makes the house more energy-efficient.

Also using Computational Fluid Dynamics (CFD) in designing buildings like Shabani and Majkut talk about in 2024 gives useful information for improving thermal management systems. Their research on how steam turbines work with two-phase flows shows how accurate modeling is needed to cut down on energy losses and make things work better [22]. Using such advanced CFD approaches in the design of amphibious houses can improve more their energy performance by optimizing the thermal properties of materials and systems used. Consequently, these structures will be guaranteed to maintain ideal inside conditions while using the least amount of energy possible.

When the voltage of islanded microgrids is controlled using robust model predictive control (RMPC), these autonomous power systems are more dependable and stable. RMPC systems provides adaptive voltage swing management and efficient power distribution even in the face of fluctuating renewable energy sources and load demand. Microgrids must maintain their energy efficiency and operational integrity if we use them as a crucial part of a sustainable energy infrastructure [23].

Table 3. Energy-Efficient Systems in the Amphibious House

System	Description
Solar Panels	Provide renewable energy for electricity
Mechanical Ventilation Heat Recovery	Ensures continuous fresh air and heat retention
Geothermal Heat Pump	Provides sustainable heating and cooling

7. Sustainable Elements

The house uses large windows for natural light and passive solar heating. Timber cladding provides natural insulation to enhance both energy efficiency and the building's aesthetic appeal (Fig 1.2).

Figure 1.2: Façade of Amphibious House [24].

The house uses passive heating and cooling ways such as high-performance insulation and airtight construction to save on energy. The geothermal heat pump system makes it more green by giving efficient heating and cooling.

Amphibious houses with their flood-resilient features can also use different green technologies to improve their environmental performance. Adding solar panels rainwater harvesting systems and energy-efficient appliances help to lower down the carbon footprint of this home. Mixing creative design with eco-friendly technologies gives amphibious houses a complete approach to sustainable living which deals with both immediate and long-term environmental problems [2].

Also the performance of water management stuff like weirs is really important for good flood control and managing water resources. Numerical simulations show that aeration can make A-type rectangular and trapezoidal piano key weirs work better by making flow conditions better and cutting down on energy loss. In this way we can design and run weirs more efficiently helping with managing water resources and flood control [25]. Using advanced simulations in designing water management systems can make the infrastructure stronger and more sustainable.

Table 4: Water Management Systems

System	Function
Rainwater Harvesting	Collects and stores rainwater for reuse
Biotreatment Plant	Processes wastewater to a high-quality standard

By using solar panels and a geothermal heat pump, the house can produce a big part of its own energy needs. This cuts down its carbon footprint and improve on energy security.

8. Materials and Design Considerations

The house is built with low VOC materials like natural insulation and non-toxic paints to keep the indoor air healthy. This choice helps avoid harmful chemicals. For an Amphibious House, good materials include Yakal and Teak lumber Marine Plywood Aluminum Mesh Galvanized Iron Woven Split Bamboo Mat Galvanized Iron Sheet and Styrofoam. To float the house the floating device needs to lift it so the weight of the materials is very important. While heavy materials are usually stronger, but lighter materials are better for amphibious houses. Timber is liked for being light easy to build with and available locally. The study finds these materials are key for making the amphibious house stable and reliable [26].

Big windows and smart orientation let in lots of natural light and help with passive ventilation. This helps indoor air quality and cuts down on the need for artificial lighting. It also makes the living space healthier and more comfortable for the people who live there (Fig 1.2 & 1.3).

Figure 4.31: Roof Window of Amphibious House [24].

The mechanical ventilation heat recovery system keeps fresh air coming in which helps maintain good indoor air quality and lowers the risk of breathing problems. This system is really useful for homes in flood-prone areas where damp conditions can make air quality worse (Fig 1.4).

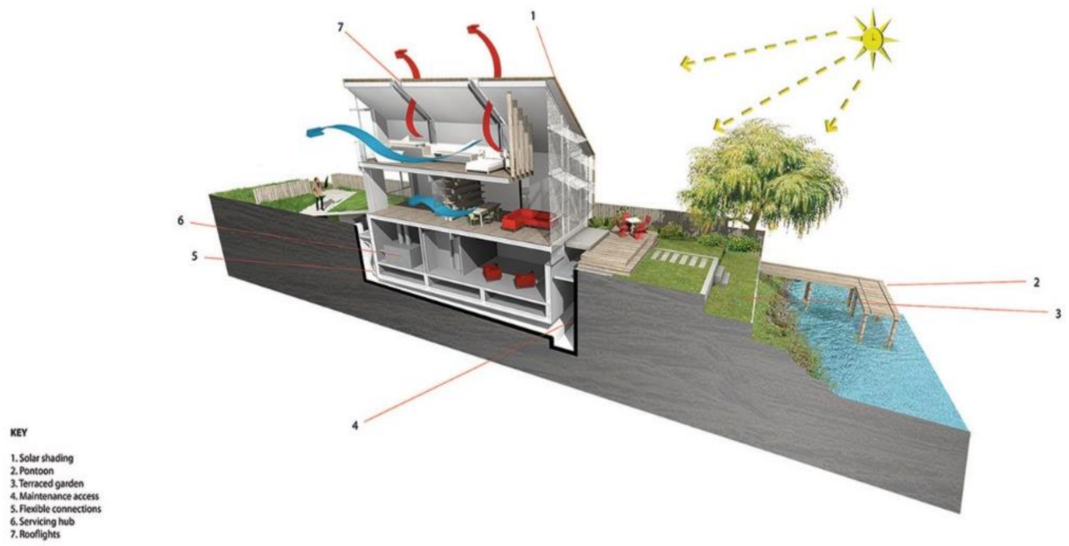

Figure 1.4: Renewable Energy using of Amphibious House [27].

The materials used to build the Amphibious House each have special benefits making them good for this job. Styrofoam used for floating keeps its buoyancy even if it gets punctured it does not waterlog rust or corrode and works well in salt or fresh water. It is cheap but really effective. Good lumbers like Yakal and Teak are strong easy to fix and maintain and simple to work with. Marine Plywood is light strong resistant to moisture and not too expensive for things like flooring and walls. Galvanized Iron Sheet on the roof lasts a long time needs no maintenance and helps make the house more sustainable. Aluminum Mesh is great for protecting the Styrofoam and it doesn't rust making the whole structure more durable [26].

Table 5: Health and Well-Being Features

Feature	**Benefit**
Large Windows	Maximizes natural light and ventilation
Low VOC Materials	Ensures a healthy indoor environment
Mechanical Ventilation Heat Recovery	Maintains high indoor air quality

9. Impact on the Environment and Community

Flood resilience is really important in sustainable architecture especially where extreme weather happens often. A review of flood resilience strategies shows how important it is to use flexible flood management solutions that change with the environment. The review finds several good ways to boost flood resilience like using amphibious designs that let buildings float and adjust to different water levels. Important things for better flood resiliency is using advanced design methods and good water management systems and also preparing the whole community [28].

Also, using advanced numerical methods in architectural design like Shabani et al. (2024) talk about has given new ideas for making buildings more eco-friendly. Their study on different numerical ways to simulate condensing flows in steam nozzles and turbine cascades shows how these techniques can improve the efficiency and sustainability of building projects [29].

Besides flood resilience managing resources and operations well in sustainable architecture projects is really important. A case study on scheduling automated intelligent vehicle (AIV) transporters in a busy job-shop environment shows how using simulation-based learning can help make operations better. This method can be used for logistics and resource management in sustainable buildings making sure material use and construction are both efficient and eco-friendly [30].

Dealing with product expiration dates in supply chains is really important to cut down on waste and use resources better. Using a two-echelon multi-objective supply chain model helps to manage costs cut environmental impacts and handle product shelf life. By using Multi-Objective Decision Making (MODM) techniques companies can balance inventory levels transportation routes and storage conditions to make products last longer and reduce carbon footprints [31].

The house's flood-resilient design ensures its safety and stability In flood-prone areas. It reduces the demand for emergency assistance during flooding events and strengthens the resilience of communities. This strategy encourages sustainability and disaster preparedness during high-risk periods.

The fact that amphibious buildings are less environmentally harmful than conventional flood defence systems is one of their main advantages. Levees and barriers, which may harm the local ecosystem and require extensive maintenance are not necessary for the residence. Instead amphibious houses adjust to natural water changes. In this way they fit better with the environment and don't need major changes to waterways and landscapes [2].

Seismic resilience vulnerability and energy efficiency are really important in sustainable architecture especially with climate change. Looking at these things together helps make buildings last more and work better for the environment. To boost seismic resilience and energy efficiency, materials and building methods that handle earthquakes well and also cut down on energy use are important [32].

Choosing the Amphibious House over antiquated flood defences like levees which can damage natural habitats is more environmentally friendly. It allows water to pass through and be absorbed which is improving flood control. The house reduces its environmental effect and increases sustainability by using renewable energy sources like solar and geothermal electricity. This reduces greenhouse gas emissions In addition to lowering operating expenses.

10. Challenges and Limitations in coastal area buildings

In coastal areas that are at risk from rising sea levels and big storms new flood management methods are really important. Using air bubble curtains has shown to be a good way to stop seawater from getting into rivers. These curtains make a barrier of air bubbles which helps with rising water levels without harming the environment like old flood defenses do. This method helps keep freshwater safe and supports the health of ecosystems by keeping natural water flows and habitats connected [33].

The nature of the Amphibious House and using fancy materials and technology make it very expensive. This cost can be a big problem for wider use and affordability especially for people with lower incomes. Designing and building these homes need special knowledge and materials which can make it hard to implement them everywhere. Also adding advanced systems for flood resilience and energy efficiency needs a lot of expertise.

Shabani and others (2023) show how important it is to use accurate modeling with Computational Fluid Dynamics (CFD) tools to design sustainable buildings. Their study shows that CFD can improve how well simulations predict thermal and fluid dynamics in architecture. Using these advanced tools can help solve some of the technical problems in making amphibious homes work well in different environmental conditions [34].

Rules and insurance issues can make it hard for more people to use amphibious homes. Building codes and insurance plans might not support these new designs yet.

Conclusion

The Amphibious House in Buckinghamshire UK is a big step forward in sustainable architecture and offers a complete answer to the problems from climate change and floods. This new design shows how adaptive planning can mix flood resilience with energy efficiency and being kind to the environment setting a high standard for future flood-prone projects.

The main thing about the Amphibious House is its floating base made of expanded polystyrene which lets the house float during floods. this is completely different and unlike traditional flood defences like levees and barriers which can fail and harm natural habitats. The house is strong and safe even during strong floods thanks to its floating design which allows it to rise with the water levels. This clever concept offers a better method to deal with growing water levels in addition to lowering the risk of flooding.

further being flood-resistant, the Amphibious House also uses green technologies to improve its sustainability. Solar panels and geothermal heat pumps and also a mechanical ventilation heat recovery system work together to cut down on the need for non-renewable energy. These more affordable solutions also cut greenhouse gas emissions which is in line with environmental goals. The use of locally obtained wood and ecologically friendly insulation further shows a commitment to lowering down on carbon emissions and encouraging sustainable building approaches.

This combination of materials and technologies shows a larger trend in sustainable architecture which is the fusion of cutting-edge technology and environmentally conscious design. Research on sustainable architecture backs this trend showing that good flood resilience needs both smart design and proactive planning [15]. The Amphibious House uses this approach. It is providing a model for how architectural design can meet the demands of a changing climates.

It is a great example for future buildings in flood-prone areas. It shows how architecture can adjust to climate changes by using strong design features and green technologies. This method helps deal with current environmental problems and sets a standard for future projects that help to improve community resilience and cut on environmental harm. Combining flood management systems with eco-friendly technologies and materials gives good ideas for making buildings that adapt well and are kind to the environment.

This house shows how important it is to have new architectural solutions to tackle climate change effects. As risks like flooding become more common, buildings need to be adaptable and resilient more than ever. What we learn from the Amphibious House gives a model for future architecture of mixing modern design with green technologies can make living spaces that are both tough and eco-friendly.

The Amphibious House shows how intelligent design may address climate change issues and how sustainable building is evolving. By combining energy efficiency and renewable materials and even flood resilience provides a model for future construction projects in regions risky to flooding. Its success not only makes its occupants safer and more comfortable but also helps with big goals of environmental care and community strength. As climate conditions get more unpredictable, this project will help guide future architecture and make sure we build strong and sustainable living spaces.

References

1. Dixon, T.J., *Sustainable urban futures and sustainable urban systems in the built environment: towards an integrated urban science research agenda.* Journal of Sustaina bility Research, 2022. **4**(4).
2. Urkude, T., et al., *Review on amphibious house.* Int. Res. J. Eng. Technol, 2008. **6**: p. 15 58.
3. Zarean Dowlat Abadi, J., et al., *A Multiobjective Multiproduct Mathematical Modeling for Green Supply Chain considering Location-Routing Decisions.* Mathematical Problems in Engineering, 2022. **2022**(1): p. 70 0 9338.
4. Khanolkar, A.V., A.E. Jadhav, and A. Patekhede, *A Review on: Amphibious House.* 2019.
5. Ghorashi, S.M., et al., *The role of subcultures in creating new social issues (with an emphasis on the context of old and new neighborhoods in Tafresh): Qualitative analysis.* Current Opinion, 2024. **4**(3): p. 679-696.
6. Panahi, S., F. Cheraghifar, and S. Talebian, *An Investigation on Painting and Imagery in Zen.* Modern Applied Science, 2018. **12**(9): p. 200-208.
7. Guy, S. and G. Farmer, *Reinterpreting sustainable architecture: the place of technology.* Journal of Architectural Education, 2001. **54**(3): p. 140-148.
8. Sassi, P., *Strategies for sustainable architecture*. 2006: Taylor & Francis.
9. Bennetts, H., A. Radford, and T. Williamson, *Understanding sustainable architecture*. 2003: Taylor & Francis.
10. Hegger, M., et al., *Energy manual: sustainable architecture*. 2012: Walter de Gruyter.
11. Gauzin-Müller, D., *Sustainable architecture and urbanism: concepts, technologies,*

examples. 2002: Springer Science & Business Media.
12. Vijayalaxmi, J., *Towards sustainable architect ure–a case with Greentainer.* Local environ ment, 2010. **15**(3): p. 245-259.
13. Keitsch, M., *Sustainable architecture, design and housing*. 2012, Wiley Online Library. p. 141-145.
14. Tabb, P.J. and A.S. Deviren, *The greening of architecture: A critical history and survey of contemporary sustainable architecture and urban design*. 2017: Routledge.
15. Singh, P., et al., *Lessons from case studies of flood resilience: Institutions and built systems.* Transportation research interdisciplinary perspectives, 2021. **9**: p. 100297.
16. Ghorbani, M., H. Wang, and N. Roberts, *Analytical and numerical modeling of phase change material and hybrid PCM-heat sinks for high-power wireless EV charging.* International Communications in Heat and Mass Transfer, 2024. **154**: p. 107460.
17. Karimzadeh, M., et al., *Machine Learning for Additive Manufacturing of Functionally Graded Materials.* Materials, 2024. **17**(15): p. 3673.
18. Emdadi Derabi, M., M. Sangsefidi, and O. Rahmani, *The effect of thickness on the multiwalled carbon nanotubes performance in glass/epoxy composite laminates under dynamic loading.* Polymer Composites, 2021. **42**(11): p. 5789-5800.
19. Ghorbani, M. and H. Wang, *Computational modeling and experiment validation of a microchannel cross-flow heat exchanger.* International Communications in Heat and Mass Transfer, 2023. **149**: p. 107116.
20. COHEN, T., *Introducing Britain's first amphibious house that rises with water to escape a flood*. 2012, https://www.dailymail.co.uk/news/article-2100757/Introducing-Britains-amphibious-house-rises-water-escape-flood.html: Daily Mail.
21. Cerro, C., *The future of dwelling: Rocking the houseboat.* International Journal of Environm ental Impacts, 2020. **3**(4): p. 363-374.
22. Shabani, S. and M. Majkut, *CFD approach for determining the losses in two-phase flows through the last stage of condensing steam turbine.* Applied Thermal Engineering, 2024. **253**: p. 123809.
23. Kiani, S., et al., *Learning Robust Model Predictive Control for Voltage Control of Islanded Microgrid.* IEEE Transactions on Automation Science and Engineering, 2024.
24. Mairs, J., *Baca Architects completes buoyant house on the River Thames*. 2016, https://www.dezeen.com/2016/01/20/baca-architects-bouyant-amphibious-house-river-thames-buckinghamshire-floating-architecture/: Dezeen.
25. Souri, J., et al., *Numerical simulation of aeration impact on the performance of a-type rectangular and trapezoidal piano key weirs.* Modeling Earth Systems and Environment, 2024: p. 1-20.
26. Nopia, J.R.C. and M. Sedan, *Amphibious house: a design structure in flood-prone areas,'.*
27. Architects, B., *The Amphibious House*, in *https://www.baca.uk.com/amphibious-house-case-study* A.C. Study, Editor. 2018, Baca Architects.
28. Bassas, E.C., J. Patterson, and P. Jones, *A review of the evolution of green residential architecture.* Renewable and Sustainable Energy Reviews, 2020. **125**: p. 109796.
29. Shabani, S., et al., *An investigation comparing various numerical approaches for simulating the behaviour of condensing flows in steam nozzles and turbine cascades.* Engineering Analysis with Boundary Elements, 2024. **158**: p. 364-374.
30. Hosseini, A., Z. Yahouni, and M. Feizabadi, *Scheduling AIV transporter using simulation-based supervised learning: A case study on a dynamic job-shop with three workstations.* IFAC-PapersOnLine, 2023. **56**(2): p. 8591-8597.
31. Iraj, M., et al., *Presenting a two-echelon multi-objective supply chain model considering the expiration date of products and solving it by applying MODM.* Sustainable Manufacturing and Service Economics, 2024. **3**: p. 100022.
32. Ademovic, N., et al., *Seismic resilience, vulnerability and energy efficiency in respect of climate change.* Frontiers in Built Environment, 2023. **9**: p. 1320150.
33. Kahrizi, E., et al., *Experimental evaluation of two-layer air bubble curtains to prevent seawater intrusion into rivers.* Journal of Water and Climate Change, 2023. **14**(2): p. 54 3-558.

34. Shabani, S., et al., *Validation of the CFD Tools against In-House Experiments for Predicting Condensing Steam Flows in Nozzles.* Energies, 2023. **16**(12): p. 4690.