

Interreg



Co-funded by  
the European Union

Aurora

# Tiny homes preparatory project

## State of the Art report

30.9.2024

Lapland University of Applied Sciences

Arctic Construction Cluster Finland

LTU Business



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## Background

This report is prepared in the Interreg Aurora financed micro project called Tiny homes preparatory project. The aim of the project was to explore how tiny homes in Northern Finland and Sweden can address regions needs for affordable housing that is suited to harsh conditions. The region's unique challenges with seasonal tourism and mining, large temporary labor-intensive industrial investments demand innovative and flexible solutions. Tiny homes, with their adaptability and mobility could cater to diverse user groups in various different settings.

The project's focus was on navigating legal complexities, collaborating with key partners, and aligning with local culture explores tiny homes as an answer for the unique characteristics of the implementation area. Further research was essential to explore their environmental adaptability, cultural relevance, compliance with regulations, strategic land use, user dynamics, legal clarity, and effective collaboration, particularly in the challenging northern conditions.

Tiny homes-procedure involves the built environment and technical services, which have to be arranged in a flexible way. Technical services are based on renewable natural resources and energy and ecological efficiency. The project also applied a cross-border tiny homes initiative in Northern Finland, Norway and Sweden. The preparatory stage involved assessing the region, creating a comprehensive project application, and establishing communication channels with local stakeholders. Tiny homes-solutions can also be applied to export efforts to third countries whose climate conditions may vary. Key actors at the preparatory stage were Lapland University of Applied Sciences and Arctic Construction Cluster Finland from Finland and LTU Business from Sweden. The project invited municipalities and businesses to participate in the action.

## Need assessment

**In the northern part of Sweden**, we have a big need for skilled personal to work in this "Green Industries". Today it is challenging with workforce just living temporary in the concept of "Fly in fly out". From "Kiruna växer" comes the initiative "Tiny Villages". The concept "Tiny Villages" consists of a cluster of Tiny Houses with a "Community -building ""Gemensamhetsbyggnad". In Kiruna they have the challenge with people coming to work with interesting jobs but move after 18 months depending on the lack of social interaction. The "Tiny Villages" concept can be a circular building solution. The social aspect is very important, so the people get the chance to integrate in the society. The technical circular

building concept reduce the carbon footprint. The threshold decreases in this concept make the economic situation affordable to buy the Tiny Village concept. The Tiny Villages solution for Kiruna and other municipalities in the Northern Sweden, Northern Finland and Northern Norway is a possibility for them to increase.

Daniel Kangas at Kiruna Växer has the responsibility in Kiruna to find alternative to find area to build houses on. Depending on the coming increasing mining activity in Kiruna there is very little area to get permanent building permits. One solution is to build Tiny Villages on temporary building permits for ten plus five years. The houses shall be in the size of an "Attefallshus" 30 m<sup>2</sup> so you can reuse the house as a single "Attefallare" or in a new "Tiny Village" area.

In-depth interview with Samuel Holmström CEO at Lundqvistträvaru AB. Lundqvist timber products manufacture kits for different types of houses, garages and holiday homes. They have different building systems that are different depending on what you are going to build. The company has a plug-in free 3D configurator and is a leader in the industry towards a simple, cost-effective and more sustainable construction industry, with the customer in focus! For the house manufacturers it is a challenge to adapt to the high interests in the market that have been. To have the possibility to build you must have a smart standard concept of the houses that are easy to design and to produce. You must go from the linear way of building to a circular process to build. In Sweden can this be a concept to build movable "Attefallshus".

Samuel Holmström says that it's no problem for the manufacturer to build the houses the challenge is to get the building permit from the municipalities. The municipalities in Sweden interpret the regulations for house construction in different ways, which leads to slow and costly processes. Samuel Holmström asks for a consensus among the municipalities in Norrbotten on how the building regulations should be interpreted.

In-depth interview with a SME company Per Söderberg, CEO at Snickereri Bygg & Marint AB (SBM) in Norrfjärden. SBM has 7 employees and is a construction company. SBM operates locally where they build and choose materials that are good for the environment – both inside and outside the walls of the building. Per says the "Tiny Villages" concept is interesting and it will be a fast and easy project to build for a small company. With the Tiny Village concept, you do not need to prepare the ground in the same way as traditional housing construction. Ensure the regulations with the municipality so that you can build in the way in all municipalities in Norrbotten.

In-depth interview with Urban Wasikkaoja, working as a purchaser for construction site at Peab in Norrbotten. Peab is the Nordic Community Builder with 14,000 employees and net

sales of SEK 57 billion. With a local presence and focus on their own resources they develop, do the groundwork and build everyday life where it's lived. Company headquarters are in Förslöv on Bjäre Peninsula in southern Sweden. The Peab share is listed on Nasdaq Stockholm. Urban says that the concept is not interesting for a large construction company like Peab. It can be interesting for some stakeholders who like to live closer to nature. To have success you need to build an example village to show how it works. Make sure with the municipality that they allow this type of construction. What are the connection fees for water, sewerage and electricity.

In-depth interview with Michael Thorngren, working as a CEO for construction company TN Bygg. TN Bygg has its main office in Gällivare and have local offices in Luleå and Kiruna in Norrbotten. The construction company TN take on all types of assignments in construction and civil engineering, and they carry out standard and special projects for customers in the basic industry, commercial industries, real estate and the public sector. TN Bygg is interested to produce Tiny Villages in their own fabric in Gällivare.

From the in-depth interview with different stakeholders above, we have the conclusion that the most important stakeholders in this process are the municipalities in Norrbotten. They have a need for houses for the people who will move to work in the New green industries. The municipalities are willing to be in the process to develop the same interpretation of the regulations for the Tiny Village concept.

Team's meetings have been performed with 8 Municipalities and Gällivare näringsliv and we have evaluated the most important questions about the building regulations. This evaluation has been transformed to the Finnish market and workshops have been performed. LTU Business and Kiruna växer continues to have meetings with the municipalities and coach them to interpret the regulations in the same way.

**The survey sent to 600 recipients in Finland** received approximately 20 responses, identifying several important factors to consider for the Tiny Homes initiative. The top priorities included a shared vision between stakeholders, legal restrictions, optimal home sizes, and the planning of a small community with central facilities and 20-40 homes. Additional considerations focused on temporary building permits, flexibility and resilience in case of emergencies, accessibility, fire regulations, transportation, and logistical challenges.

Further feedback highlighted the importance of handling waste management efficiently, both within homes (sorting at least seven types of waste) and through communal collection points. Energy-efficient heating solutions, off-grid capabilities, and flexibility in terms of modularity and expandability were also key areas of interest.

Other considerations involved cost-efficiency, legal processes, and the possibility of lighter regulatory procedures for temporary housing, especially in rural areas. Stakeholders expressed a need for adaptable designs that could accommodate different seasonal needs, local engagement, and sustainable waste practices. Additionally, attention was called to storage space, off-grid energy, reuse of construction materials, and compliance with evolving legislation.

Overall, the feedback based on questionnaire underscores the complexity of implementing such a project, stressing the balance between legal, environmental, and practical concerns to ensure the success of the initiative.

The workshop report from August 28, 2024, in Rovaniemi offers a comprehensive analysis of the feasibility and challenges of the **Tiny Homes** concept. The report gathers input from various working groups discussing how to design, implement, and scale Tiny Homes effectively. Here is an analysis based on the report's insights, emphasizing the **Tiny Homes** concept's core aspects, opportunities, and challenges.

### Key Themes for Designing and Implementing Tiny Homes:

1. **Collaboration and Modular Design:** Successful implementation of Tiny Homes relies heavily on **collaborative efforts** between planners, architects, builders, and municipalities. A modular approach enables **scalability** and **flexibility**. By creating **standardized designs**, costs can be reduced, and mass production becomes more feasible. Additionally, integrating key stakeholders early in the process ensures projects align with local regulatory, community, and environmental factors.
2. **Cost Efficiency and Life Cycle Thinking:** A central concern is achieving **cost-efficiency**. Groups stressed the need to consider the **entire life cycle** of Tiny Homes, from construction through to maintenance and eventual decommissioning. This includes **budgeting**, competitive sourcing of materials, and determining the number and size of homes for each development. Prefabrication and **factory-built modules** also emerged as important factors in maintaining cost-efficiency while reducing the environmental impact of construction.
3. **Flexibility and Adaptability:** The concept of **adaptability** is critical to the success of Tiny Homes. Tiny homes should be designed with the potential for **functional repurposing**—whether for single professionals, families, or temporary workers. Modular designs also allow for expansions or alterations based on changing household needs over time. **Scalability**, another important factor, would allow Tiny Homes to meet the needs of different regions and communities, particularly in high-

demand areas or during crisis situations (e.g., using Tiny Homes as **temporary housing solutions**).

4. **Zoning, Permits, and Regulatory Requirements:** The report emphasized the importance of navigating **local zoning laws** and **regulations**. Tiny Homes need **clear permit procedures**, possibly **simplified** for temporary or semi-permanent housing solutions. Understanding local **building codes** and **infrastructure limitations** (such as water, sewage, and electricity) is critical for a successful project. Groups suggested **advocating for lighter regulatory frameworks** for Tiny Homes and ensuring **municipal support** through incentives like **leased plots** for these developments.
5. **Design for Diverse User Groups:** Several user groups could benefit from Tiny Homes, including **young professionals**, **seasonal workers**, and **seniors** (e.g., the Sami elder population). The **modularity** and **flexibility** of these homes make them well-suited for a variety of demographics, from **temporary housing for workers** (such as in Lapland or mining regions) to **permanent housing for small households**. For families, there is a demand for larger units or designs that allow for **expansion**. However, Tiny Homes may not be suitable for larger families or those needing long-term housing with more stability, particularly due to concerns about size and **suitability for children**.
6. **Sustainability and Environmental Considerations:** Sustainability is a key focus of the Tiny Homes concept. The working groups discussed how Tiny Homes can contribute to **energy efficiency**, **ecological building practices**, and the use of **renewable energy**. The homes can integrate **recycled materials** and facilitate easier **waste management solutions**, making them attractive from an **environmental sustainability** perspective. Tiny Homes are also advantageous in areas with limited or no access to **municipal infrastructure**, thanks to their **lower foundation needs** and adaptability to various terrains.

#### **Opportunities Identified in the Tiny Homes Concept:**

- **Scalability:** Tiny Homes can easily be scaled depending on local needs, such as in areas with **housing shortages** or for **temporary accommodation** (e.g., for seasonal workers or as emergency shelters in crisis situations).
- **Sustainability and Circular Economy:** There is significant potential to incorporate **recyclable materials** and ensure **energy-efficient designs** for healthier indoor environments and a lower carbon footprint.

- **Economic Potential:** Beyond housing, the **commercial potential** for Tiny Homes includes **tourism, temporary lodging,** and **export opportunities** (e.g., in countries like Ukraine).
- **Community Focus:** Tiny Homes can foster a sense of **community** with shared spaces and common resources while still offering privacy and independence for residents.
- **Customization:** The homes can support **customized interiors,** meeting diverse aesthetic preferences, and be **easily transported** or **expanded** as needed.

#### Challenges and Risks:

- **Public Perception:** There are concerns that Tiny Homes might be associated with **slum-like conditions** or temporary, substandard housing, especially if the construction quality is poor. This could undermine their appeal.
- **Affordability vs. Quality:** While Tiny Homes are meant to be cost-effective, there is a fine balance between keeping costs low and ensuring **durable, high-quality builds.** High costs could alienate target groups like **seasonal workers** or **families.**
- **Regulatory Barriers:** Zoning laws, **building permits,** and compliance with **local infrastructure** present potential obstacles. These challenges vary across municipalities and can lead to delays or increase project costs.
- **Target Audience:** Some groups—such as **families with children** or those with **pets**—might find Tiny Homes impractical due to space limitations.
- **Logistics and Infrastructure:** Moving, installing, and connecting Tiny Homes to existing infrastructure (such as electricity and plumbing) could pose logistical challenges, particularly in areas with stringent **regulatory requirements** or difficult terrain.
- **Financing:** Questions remain about **funding models** and whether governments, private investors, or public grants will support Tiny Homes at scale. Without clear financial backing, projects may struggle to be realized.

#### Conclusion:

The **Tiny Homes** concept offers significant potential as a flexible, scalable, and sustainable solution to various housing challenges, particularly for **small households, temporary**



**accommodation**, and areas with **housing shortages**. However, to achieve widespread adoption, careful attention must be given to navigating **regulatory hurdles**, ensuring **affordability**, and overcoming **logistical challenges** related to installation and infrastructure. A strong emphasis on **collaboration**, **modular design**, and **environmental sustainability** will also be key to ensuring the long-term success of the Tiny Homes movement.

## Legislative framework

The project interviewed and had meetings with authorities dealing with legislation. There was some feedback concerning building near city, as often those areas already have a visionary plan of future use. Certain factors are already expressed above. To be noted, that in Finland, legislation will change early 2025. It is not expected to cause significant problems concerning planning Tiny homes.

The **Swedish Planning and Building Act (2010:900)** allows for **temporary building permits**, which are particularly relevant for the construction of tiny homes. Here is a summary of the key points:

- **Temporary building permits** can be granted if a project meets some but not all of the necessary conditions. This is beneficial for tiny homes, which can serve as temporary housing solutions.
- The **duration of the building permit** can be for a maximum of 10 years initially, with the option to extend for another 5 years at the applicant's request. The total period cannot exceed 15 years unless specific exceptions apply.
- **Restoration of the site or building:** When the temporary period ends, the site or building must be restored to its original state, unless a permanent building permit has been granted. This is especially important for tiny homes in temporary areas, ensuring they are removed or restored if permanent development is not pursued.

In summary, this legislation offers flexibility for building tiny homes as temporary solutions but also establishes strict limits on their duration and the need for eventual restoration or removal.

The **Attefall house** concept in Sweden refers to a small residential building that can be constructed on a property without a formal building permit, under certain conditions. Introduced in 2014, the Attefall house (named after Stefan Attefall, the former Swedish Minister for Public Administration) allows property owners to build an extra structure of up to **30 square meters**.

**According to Boverket and the Attefall regulations, the following criteria must be met for building a detached house (Attefallshus):**

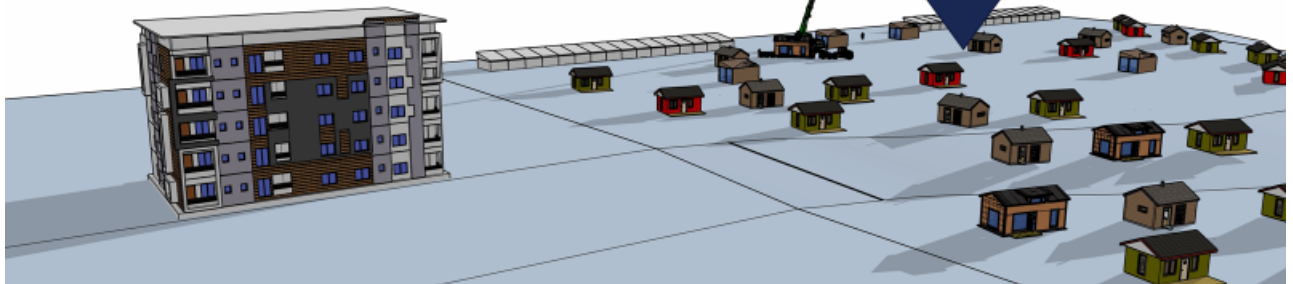
- There must be an existing one- or two-dwelling house on the plot.
- It must be a complementary building or a complementary residential building.
- The building may be no more than **30.0 m<sup>2</sup>**.
- The **height of the roof ridge** may not exceed **4.0 meters**.
- It should be **independent**.
- It should be located in the **immediate vicinity** of one- or two-dwelling buildings.
- It must be placed at least **4.5 meters from the property border**.
- It must be located at least **30.0 meters from the railway**.
- It cannot be erected near buildings or in **built-up areas that are particularly valuable**.
- There must be no **extended building permit requirement** for Attefallshus in the detailed plan for the area.
- If it is a complementary residential building, it must not be located within or adjacent to certain areas of **national interest for total defense**.

## Affordable housing

LTU Business has calculated, that it is cheaper to build a Tiny village than flats. See comparison below. This topic has been discussed also under other headings of this document.

50 apartments in apartment buildings (40sqm)  
5 years of design and construction time  
>100 million SEK in investment (Requires 20 million SEK equity. Selling on prospect is a possibility)  
In principle, only suitable in urban neighborhoods.  
A small proportion of the land in the municipalities is suitable  
Few players have that solidity.  
Is not movable and in that sense not circular

50 Tiny homes (30sqm + ceiling)  
Objectives for the feasibility study:  
2 years design & construction time  
SEK 50-75 million in investment (SEK 3-6 million equity ratio using the intended business model)  
Suitable on private land outside the city centers  
A large proportion of the land in the municipalities can be suitable and attractive close to nature.  
A larger number of actors who have both that land and that equity (many landowners have limited free capital)  
Movable including the area's infrastructure, and in that sense circular.



## Benchmarking and collaboration with other projects

Partners made effort in developing and/ or studying connection to Tiny homes concept with various regional and transnational project.

Scabeac – The need to collaborate in the construction industry is perhaps greater than ever. Therefore, northern Sweden, Norway and Finland are joining forces and establishing a long-term cooperation platform for sustainable construction in cold climates. In this work we have seen the need in the area for development of the concept of Tiny Homes and create a cluster of houses to Tiny Villages.

### Tiny Village (Sweden)

Our goal is to investigate practical and regulatory conditions to build small villages during 2024 (June 2024 - February 2025), as well as initiate collaborations to realize the concept throughout north Sweden.

### Ukrain project

In the ACCF project “Internationalization of ACCF and rebuild Ukraine” we are going to take the tiny homes prototypes from Finland to a building fare near Kiev. We have found six manufactures and an architect that are willing to do this. The funding of this action is still open.

### Annex

In March 2025 we are going to apply for funding to a project called Annex Arctic in which we are going to make a study of the laws and regulations concerning construction in Arctic and also Tiny homes concept. We are going to find out and list the differences between the Nordic countries.

The CoolBox project by Lapland University of Applied Sciences was carried out from August 3, 2020, to June 30, 2023. Project aimed to strengthen the competitiveness of small and medium-sized enterprises (SMEs) in Lapland, focusing on digitalization and ecological economy. Throughout the project, ten public technology prototypes were developed, addressing low-carbon construction from various perspectives, alongside the creation of three microbuilding concepts. These prototypes were based on issues and ideas gathered from local businesses and were tackled by a multidisciplinary team of experts. The project actively engaged local companies through workshops and networking events, successfully involving them in the ideation and development processes.

The outcomes of the CoolBox project included innovative prototypes such as the microhouse prototype, off-grid prototype, and various digital and renewable energy solutions. These prototypes were showcased through videos, images, and animations on social media and the project's website, enhancing visibility and awareness, and the microhouse prototype is showcased in Lapland UAS campus in Rovaniemi. The project also fostered collaboration among local businesses, leading to the initiation of product development and commercialization efforts by some participants. Despite challenges posed by the COVID-19 pandemic, which affected project timelines and resources, the project

achieved its primary goals of promoting low-carbon and energy-efficient building practices in the region.

The results of the CoolBox project can be utilized in Tiny Homes project in the following ways:

- **Prototype Development and Design:** The prototypes developed in the CoolBox project, such as the Microhouse prototype and Off-grid prototype, provide practical examples of how small buildings can be designed to be energy-efficient and ecologically sustainable solutions. These prototypes could serve as inspiration and a foundation for the design of new tiny homes and tiny home villages.
- **Collaboration with local businesses:** The project activated local businesses in Finnish Lapland to participate in ideation and collaboration. This model could also be beneficial in the new project, where the expertise of local companies will be in cooperation with R & D parties.
- **Digital design and workflow:** The CoolBox project utilized digital CAD and BIM models and visualisations, which allowed for the optimization of material use. The same digital design tools could be employed in the new project to enhance efficiency and reduce material waste in the design of tiny houses.
- **Sustainable construction solutions and energy efficiency:** The CoolBox project utilized developed energy-efficient solutions, such as renewable energy prototypes. These solutions could be applied in the new project to improve the energy efficiency of the tiny houses, such as utilizing solar and wind power. Also gathered knowledge and experiences regarding sustainable materials will be utilized with tiny homes concept
- **User profiles and service concepts:** In the CoolBox project, user profiles and service concepts for micro-living were created. These could be applied in the design of community villages to ensure that the tiny houses and their surroundings meet the needs and wishes of the residents.
- **Networks and Events:** The CoolBox project participated in regional networking events where prototypes were presented and networking occurred. In the new project, these networks could be leveraged to gain more visibility and participants for the initiative.

To put it shortly, the results of the CoolBox project can be utilized in various ways, particularly in enhancing energy efficiency, digital design, local collaboration, and user-

centered solutions. These solutions can be then utilized to cater wider range of users in northern Finland and Sweden.

Itäpuu

Energy community project planning group

Arctic 6G project has studied connectivity needs and issues in Lapland and partially in Sweden and pointed out the need for proper connections in intelligent housing solutions, among other topics discussed in this relation.

## Tiny home literacy review

### Introduction

The concept of tiny homes has gained significant traction in recent years as a response to various social, economic, and environmental challenges. A tiny home, typically defined as a residential structure under 50 square meters, offers a minimalist lifestyle that emphasizes efficient use of space and resources. Beyond their compact size, tiny homes often embody principles of sustainability, affordability, and community living. This review explores the definition of tiny homes, their benefits, and the advantages of tiny home villages.

Tiny homes are small, often mobile, residential units designed to maximize efficiency and minimize the ecological footprint. These homes come in various forms, including tiny houses on wheels (THOWs), stationary tiny homes, and even converted containers. Despite their limited square footage, tiny homes are designed to include all essential living spaces: a bedroom, kitchen, bathroom, and living area. The design often incorporates multifunctional furniture and innovative storage solutions to optimize the available space. The appeal of tiny homes lies not only in their compact size but also in their potential for customization and personalization, allowing owners to create unique, functional living environments that suit their needs and lifestyle.

## Benefits of tiny homes

One of the most significant benefits of tiny homes is their affordability. The cost of building and maintaining a tiny home is substantially lower than that of a traditional house. This affordability makes homeownership more accessible, particularly for young people, retirees, and those seeking to reduce their financial burdens. Lower utility bills and reduced maintenance costs further enhance the financial advantages of tiny home living. Tiny homes provide flexible and affordable housing capacity increase when areas evolve and need for housing capacity varies. Tiny homes are often constructed using sustainable materials and are designed to be energy-efficient. Their small size means they consume less energy for heating, cooling, and lighting, reducing their overall environmental impact. Many tiny homes incorporate renewable energy sources such as solar panels and rainwater harvesting systems, further promoting an eco-friendly lifestyle. The reduction in material consumption and waste during construction also contributes to their sustainability.

The minimalist nature of tiny homes encourages residents to declutter and prioritize essential belongings, fostering a simplified lifestyle. This shift can lead to increased mental well-being, as individuals focus less on material possessions and more on experiences and relationships. The reduced space necessitates mindful consumption and often leads to a greater appreciation for what one has. Tiny homes, especially those on wheels, offer unparalleled mobility and flexibility. Owners can relocate their homes easily, providing opportunities for travel and exploration without sacrificing the comfort of their personal living space. This mobility also allows residents to adapt to changing life circumstances, such as job relocations or a desire for a different living environment.

Entire villages can be created with tiny homes. Tiny home villages expand on the individual benefits of tiny homes by fostering a sense of community and collaboration. These villages are planned communities where clusters of tiny homes are situated around shared amenities and common spaces. There are plenty of benefits in tiny home villages. Tiny home villages encourage strong community bonds by design. Shared spaces such as communal gardens, recreational areas, and community centers promote social interaction and cooperation among residents. This sense of community can combat the isolation often experienced in modern suburban and urban settings.

In tiny home villages, residents can pool resources for shared amenities, such as laundry facilities, workshops, and recreational spaces. This collective approach reduces individual expenses and environmental impact, while providing access to facilities that might be impractical for single tiny home owners to maintain independently. The close-knit nature of tiny home villages creates natural support networks where residents can rely on one another for help and companionship. This support can be particularly beneficial for vulnerable populations, such as the elderly or those with limited mobility, fostering a sense of security and belonging.

Tiny home villages can serve as incubators for innovative living solutions, showcasing sustainable practices and new approaches to affordable housing. They can demonstrate the viability of alternative housing models and influence broader housing policies and urban planning strategies. Tiny home villages can have ecological and economical benefits via technical solutions. Scaling the capacity of energy production units, waste water treatment and other, usual high-cost solutions usually lead to lower cost per habitat, and might save a considerable amount of natural resources. Tiny homes and tiny home villages represent a shift towards more sustainable, affordable, and community-oriented living. By embracing minimalist principles and efficient design, tiny homes offer numerous benefits, including reduced financial burdens, lower environmental impact, and a simplified lifestyle. When aggregated into villages, these benefits are amplified through community building, resource sharing, and support networks. As societal interest in sustainable and affordable living grows, tiny homes and their communal counterparts are poised to play a significant role in shaping the future of housing.

Tiny homes offer an efficient and sustainable living solution, but their compact size and often mobile nature present unique technical challenges, particularly in colder climates. Ensuring comfort and functionality requires innovative approaches to heating, ventilation, air conditioning (HVAC), plumbing, lighting, energy management, and structural energy efficiency.

There are multiple ways to heat tiny home. Tiny home villages can benefit from centralized heating solutions, such as district heating systems or shared biomass boilers, which provide efficient and consistent heat to multiple units. Radiant floor heating systems provide consistent and efficient warmth by circulating hot water or electric heat through coils beneath the floor. This method reduces heat loss and maintains a comfortable indoor environment. Heat production can be solved by communal, larger units that distribute



energy to each tiny home. Heat pump systems offer both heating and cooling capabilities. In colder climates, cold climate heat pumps are used, which are designed to operate efficiently even at low temperatures. Compact wood stoves are a popular choice for tiny homes, providing a reliable and sustainable heat source. They are especially effective in off-grid scenarios, but seldomly work as a primary energy source if modern ease of living is expected.

Heat recovery ventilators (HRVs) are crucial for maintaining indoor air quality and retaining heat. They work by exchanging stale indoor air with fresh outdoor air while recovering heat from the outgoing air, reducing energy loss. Similar to HRVs, energy recovery ventilators (ERVs) also manage humidity, making them ideal for maintaining comfort in tiny homes located in humid cold climates.

LED lights are energy-efficient and have a long lifespan, making them ideal for tiny homes. They generate less heat, which is beneficial in maintaining a stable indoor temperature. Maximizing natural light through strategically placed windows and skylights reduces the need for artificial lighting during daylight hours, enhancing energy efficiency.

Solar panels can be installed on the roof of tiny homes to generate electricity, especially when combined with battery storage systems to ensure a reliable power supply even during cloudy days or at night. Villages can install larger solar arrays to generate power collectively, reducing individual energy costs and enhancing sustainability. Integrating smart energy management systems allows for real-time monitoring and optimization of energy usage, ensuring efficiency and reducing wastage. Systems may also center energy usage to most cost-effective hours. Centralized water treatment and waste management systems can be more efficient and environmentally friendly, reducing the infrastructure needed for individual homes. Tankless water heaters are on-demand systems that heat water only when needed, reducing energy consumption and ensuring a continuous supply of hot water. In some cases, it may offer more efficient solution compared to centralized water heating.

Effective insulation is critical in tiny homes to minimize heat loss. Materials such as polystyrene foams (EPS and XPS for example) provide superior thermal resistance. Triple-glazed windows offer excellent insulation, reducing heat loss while allowing sunlight to warm the interior. Incorporating thermal breaks in the building envelope prevents heat transfer through the structure, enhancing overall energy efficiency. Ensuring the building envelope is airtight prevents drafts and heat loss, which is essential for maintaining a comfortable indoor environment in colder climates.

Design principles has also great impact on energy system requirements and living comfort. Positioning the tiny home to maximize solar gain can significantly reduce heating needs.

South-facing windows capture passive solar heat, while overhangs and shading devices prevent overheating during warmer months. A well-planned layout minimizes the wasted floor area and ensures even distribution and reducing energy consumption.

Tiny homes and tiny home villages in colder areas require specialized technical solutions to ensure comfort, indoor air quality, efficiency, and sustainability. By utilizing advanced HVAC systems, effective insulation, energy-efficient lighting, and smart energy management, these homes can provide a viable and eco-friendly living option. Design principles such as optimal orientation, airtight construction, and the efficient layout further enhance their performance in cold climates. Tiny home villages benefit from shared resources and infrastructure, amplifying the advantages of individual tiny homes and fostering a sense of community and sustainability.

In the tiny homes project, also legislation regarding building codes will be reviewed and compared between both nationalities. Aim is to create solutions that work in both countries, Finland and Sweden.

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