

**BaltSe@nioR 2.0**



**GUIDELINES FOR  
SENIOR-FRIENDLY PUBLIC SPACES**

2021

These Guidelines for Senior-friendly public spaces were created within the project: Innovative solutions to support Baltic Sea Region (BSR) in providing more senior-friendly public spaces due to increased capacity of BSR companies and public institutions, partly financed by the European Union (European Regional Development Fund and European Neighbourhood and Partnership Instrument).

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## INTRODUCTION

The silver tsunami hits Europe. Already in 2019, the number of seniors living in the European Union exceeded 101.7 million. Thus, both public and private entities are facing a huge challenge today: how to prepare to operate in a society with a completely different demographic structure than it was a few years ago. The experts from the international consortium of the BaltSe@nioR 2.0 project prepared these guidelines which aim to help in handling this challenge.

Accelerating the aging of societies evokes enormous challenges both socially and economically. Nevertheless, it also creates many new business opportunities, as not only private households, but also public institutions will need slightly different products shaping the infrastructure of their internal and external spaces. In view of the observed demographic changes, also the public spaces (e.g. theaters, libraries, hotels, restaurants, parks and seniors' homes) need a radical change to fight ageism and be friendly to all. Noticing a customer being a senior, both in the private household and in the public space, will be one of the most important elements of building a development strategy for the future. Being prepared for this challenge is therefore of key importance also because taking into account the needs of seniors in the created products and services teaches us to be more attentive to the needs of other sensitive social groups, e.g. people with disabilities.

The senior-friendly public space, as well as the furniture in it, should be created in accordance with the principles of universal design, so they should be functional and safe for the largest possible group of users, and preferably for people of all ages. For entities that take into account this trend in the preparation of new products and services, this means an even larger group of potential customers. When designing for seniors, attention should be paid to the limitations that arise with age, resulting from the aging process of the human body. Activities that were previously performed efficiently and quickly by seniors take more time in later years of life, fatigue, backache, problems with eyesight, hearing, balance or bending also appear more often. At the same time, many research results draw attention to the problem of loneliness among seniors, pointing out the need to make efforts to enable mutual integration of seniors, not only with people of their age, but also with the younger generation. In addition, for the good mental and physical condition of seniors, it is very important to maintain contact with nature, an appropriate level of physical activity and the opportunity to develop their hobbies despite the limitations that may arise with age. All this is made possible by a well-designed and accessible public space, which by eliminating physical barriers, will encourage both older and younger residents to stay there.

Our abilities and disabilities may be permanent, temporary or situational ones and it's only up to design whether it enables or disables us. Let's remind ourselves of the important words of Paul Hogan, the President Emeritus of EIDD – Design for All Europe: "Good design enables, bad design disables".

## COLLECTION OF GUIDELINES ACCORDING TO UNIVERSAL DESIGN PRINCIPLES

Seniors are a heterogenous group with different functional abilities. They may experience different issues related to aging such as mobility issues, loss or impairment of sensory perceptions (hearing, sight, smell or touch), cognitive decline and others. On the other hand, there are also seniors who maintain very good functional ability into old age. When designing senior-friendly solutions we should thus rather obey universal design principles. According to the Centre of Universal Design, universal design is "the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design"[1]. Universal design is sometimes also referred to as "inclusive design", "design for all" or "life span design" [2].

When designing a product such as furniture or an environment such as a public space, we must consider the possibility that everyone, regardless of age or ability, can use it. The goal is not only to preserve the health, safety and well-being of users, but also to address the right to happiness of users and also maintain the sense of community that comes with a space that is accessible to all. Universal design encompasses accessibility, inclusiveness and usability. According to Universal Design, designers are urged to explore solutions that are more inclusive, rather than designs that accommodate the needs of the 100 % of the population, because these are difficult if not impossible to achieve [1]. This design thinking should be applied to furniture design, including ICT-integrated furniture solutions, and public space design.

Our guidelines are based on the [seven universal design principles](#) [1]:

**Principle 1: Equitable Use.** The design is useful and marketable to people with diverse abilities.

**Principle 2: Flexibility in Use.** The design accommodates a wide range of individual preferences and abilities.

**Principle 3: Simple and Intuitive Use.** Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.

**Principle 4: Perceptible Information.** The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.

**Principle 5: Tolerance for Error.** The design minimizes hazards and the adverse consequences of accidental or unintended actions.

**Principle 6: Low Physical Effort.** The design can be used efficiently and comfortably and with a minimum of fatigue.

**Principle 7: Size and Space for Approach and Use.** Appropriate size and space is provided for approach, reach, manipulation, and use regardless of the user's body size, posture, or mobility.

In addition to these seven principles which are **user-centred**, furniture and public spaces should also aim to follow the [Sustainable development goals](#) [3]. In these guidelines, we included the



following sustainable development goals:

**Sustainable goal 3:** Ensure healthy lives and promote well-being for all at all ages

**Sustainable goal 9:** Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

**Sustainable goal 12:** Ensure sustainable consumption and production patterns.

**Sustainable goal 13:** Take urgent action to combat climate change and its impacts.

**Sustainable goal 15:** Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

## How to read the guidelines

This document is divided in three parts:

- I. Guidelines for furniture manufacturers
- II. Guidelines for public institutions
- III. Guidelines for the usage of ICT integrated furniture for elderly in public spaces

Each chapter follows the Principles of universal design and lists concrete examples and tips, how to bring theory into practice, accompanied with visual material for better illustration. When referring to the terms, the following definitions are proposed:

**Furniture:** basic, durable, usually portable interior devices introduced in the last stage of building development. Equipment or articles that are necessary, useful, desirable to have in an environment to make the space more suitable for living or working.

**Public space:** every outdoor and indoor space that you encounter when you step out from your residence (home). A public space is also considered such a space which is a home but shared with other residents, e.g. retirement homes.

**ICT-integrated furniture:** ICT-integrated furniture is furniture that involves information and communications technology (ICT). ICT is an umbrella term that encompasses a wide array of systems, devices and services used for data processing (the information side of ICT) as well as telecommunications equipment and services for data transmission and communication (the communication side).

## I. Guidelines for furniture manufacturers

This chapter presents the knowledge on how to transfer the public furniture into senior-friendly following the universal design principles. The guidelines aim to show directions for the new product development based on the most crucial features of senior but also all-age-friendly furniture for public spaces.

### Principle 1: Equitable Use

- Make the design appealing to all users. Accessibility features should not compromise the aesthetic aspect of the furniture.
- Include accessibility from the very beginning of product design and development of furniture.
- Provide the same means of use for all users: identical whenever possible, equivalent when not.

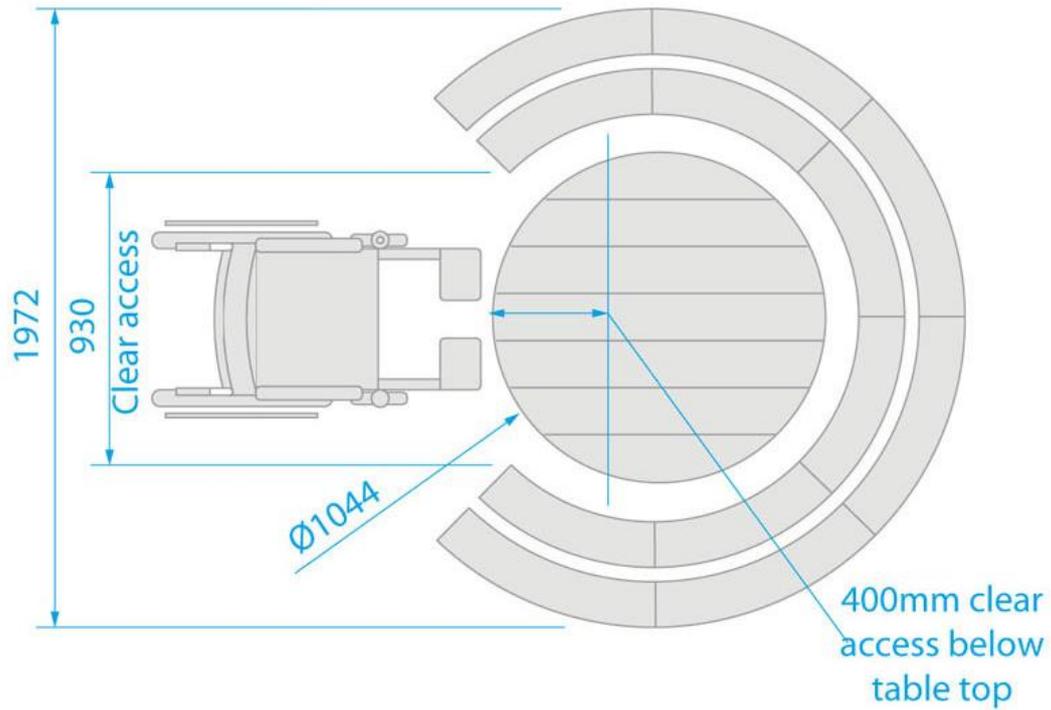
**TIP:** Provide the access for the users moving in the wheelchair.



In Åsbotorpsjön in Skövde there is a fully accessible route with outdoor furniture for dining having a place provided for a baby trolley or a wheelchair. Thus everyone can take advantage of valuable time spent outdoors. Photo: Beata Fabisiak



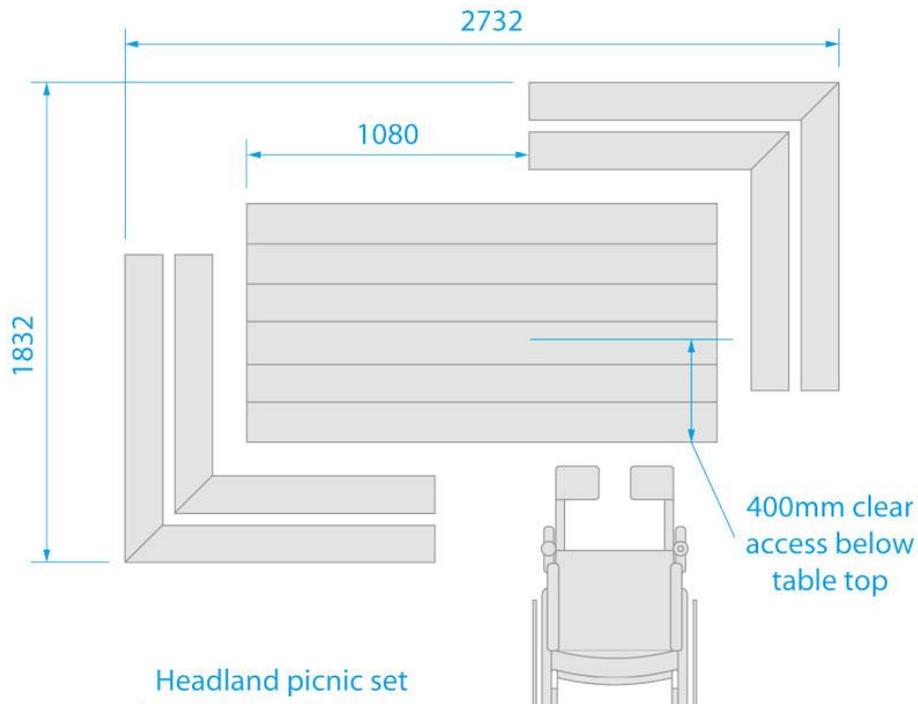
Example of outdoor furniture with aesthetic features and easy access for people moving in a wheelchair by Streetmaster Products. Photo: <http://www.streetmaster.co.uk/lakeland-picnic-set.php>



Example of outdoor furniture with easy access for people moving in a wheelchair by Streetmaster Products. Photo: <http://www.streetmaster.co.uk/lakeland-picnic-set.php>



Example of outdoor furniture with aesthetic features and easy access for people moving in a wheelchair by Streetmaster Products. Photo: <http://www.streetmaster.co.uk/headland-da-picnic-set.php>



Example of outdoor furniture with easy access for people moving in a wheelchair by Streetmaster Products. Photo: <http://www.streetmaster.co.uk/headland-da-picnic-set.php>

**TIP:** Provide an extended worktop to allow people using wheelchairs to enjoy equitable use of the same table as their company.

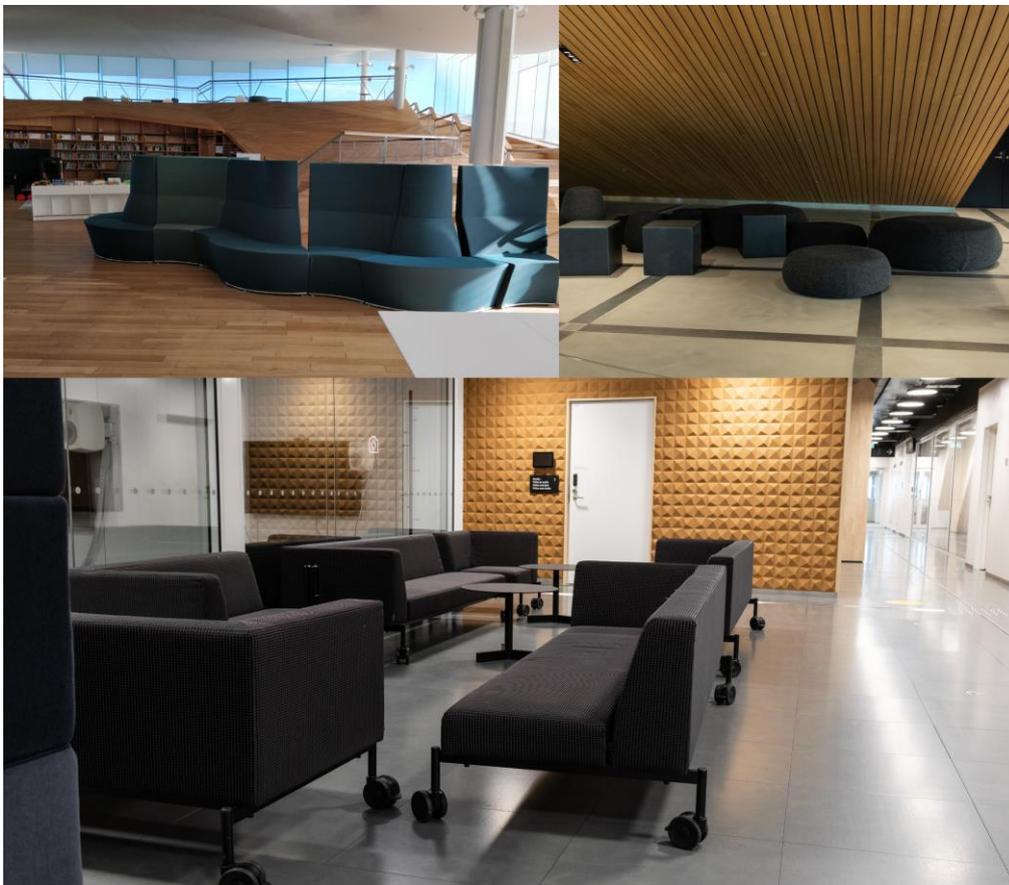


Example of outdoor furniture with wheelchair access. Photo: <https://furnitureforschools.co.uk/shop/outdoors-furniture/outdoor-tables-and-chairs/concrete-base-picnic-table-with-wheelchair-access/>

## Principle 2: Flexibility in Use

- Make the furniture movable and modular.

Modular furniture provides opportunities for changing the environment and making accessible solutions for the use of the space. Modularity allows consumers to freely change the form of the furniture, depending on their current needs and moods. Modular furniture systems are a popular solution, as the harmonized shapes and dimensions allow for any transformation, addition and combination of individual elements such as poufs, backrests, armrests, or even headrests. Therefore, depending on the arrangement of individual parts, the furniture can change its form, which allows for satisfying the individual sense of aesthetics and beauty of each user, as well as the need for comfort.



Movable and modular furniture in Oodi Central Library, Helsinki, Finland. Photo: Ryann Deloso

**TIP:** The aspect of mobility is also visible, among others in the replacement of traditional legs with wheels. This allows for quick, easy and trouble-free change of setting, and therefore free and arbitrary adjustment of the interior arrangement of the space to current needs. Often, apart from wheels, furniture can also be equipped with handles to facilitate its movement.



A chair on wheels with a tablet arm, casters and handle for easy reconfiguration. Photo: [www.nienkamper.com](http://www.nienkamper.com)

- Make the furniture adjustable.

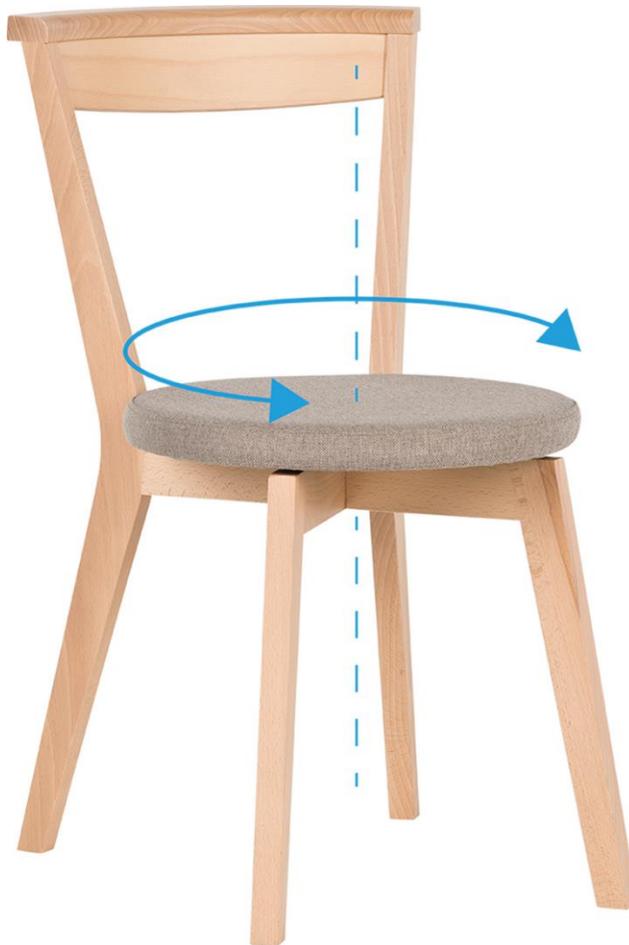
**TIP:** Provide furniture with adjustable seat heights or pieces of furniture with seats at different heights.



Photo: Porta Posnania, <https://bramapoznania.pl/en/>

- Provide furniture options for people with varying physical features.

**TIP:** Provide at least some seats with armrests and backrests or any kind of support while getting up or sitting down.



Although it doesn't have armrests, the chair Closer 4 You developed by Polish company VOX facilitates the process of getting up and sitting. The swivel seat allows to rotate 360° and grab the upper part of the backrest both with the right and with the left hand to receive the support.

Photo: <https://www.vox.pl/produkt-krzeslo-closer-117702.html>

**TIP:** Provide chairs with the seat depth of max 450 mm and with open leg room. The leg room provides space for the legs to be positioned backward especially when a person is about to stand up.

**TIP:** In a public space use furniture of different construction, i.e. a chair, a sofa for two people (love seat), which both serve as a seat for one person with a greater body weight, and as a regular sofa. Furniture in such spaces could create, for example, sets that would allow a family or a group of friends to gain more privacy and comfort; nevertheless, their diversity could also give more options to people suffering from health problems with subsequent difficulties in (living) daily life. Such a solution seems to result in much greater comfort than in the case of using chairs with a narrow seat located at small distances from each other. [4]

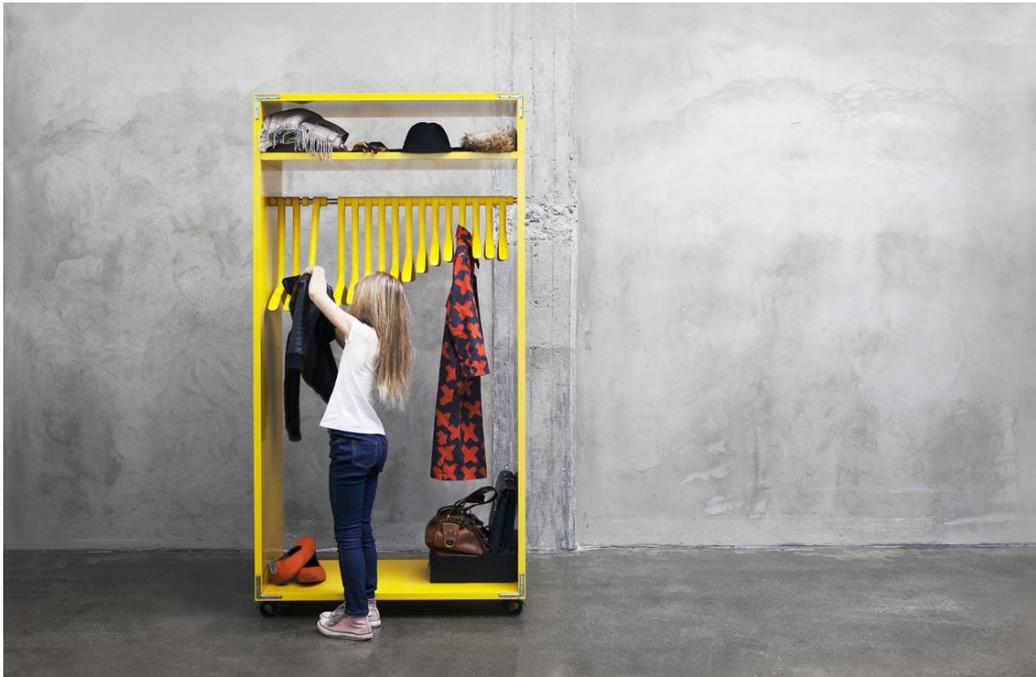


A bench with armrests options and with open leg room. Photo: Ryann Deloso

**TIP:** Provide different heights of handrails or hangers to suit the furniture both to shorter and taller users, children and adults.



A 3D printed cloth rack called DINO developed by the Finnish design studio KAYIWA in cooperation with Materialise. Photo: <https://www.3printr.com/3d-printed-dino-clothes-rack-by-materialise-and-kayiwa-1129170/>



3D Printed DINO Clothes Rack by Materialise and KAYIWA allows users of different heights to use the furniture comfortably. Photo: <https://www.3printr.com/3d-printed-dino-clothes-rack-by-materialise-and-kayiwa-1129170/>

### Principle 3: Simple and Intuitive Use

- One of the oldest definitions of design “form follows function” by Sullivan (1896) can be observed here. The appearance and design of the furniture convey its purpose to the user.



The form of this furniture conveys that it is for sitting. Photos: Ryann Deloso



Visible handles facilitate the use of cabinets. Photo: <https://www.hafele.co.uk/en/>

#### **Principle 4: Perceptible Information**

- Provide compatibility with a variety of techniques or devices used by people with sensory limitations.
- Provide adequate contrast between essential information and its surroundings.

**TIP:** Provide easy to read assembly and disassembly instructions enriched with images that will facilitate the process to all users, including those with limited literacy and speaking different language.



Building on their long-term commitment to sustainability, IKEA has issued a new range of Disassembly Instructions for their most popular products. That means now everyone can take it apart correctly, reducing the risk of damage, and reducing its impact on the environment. Source: Steve Collinge

#### Principle 5: Tolerance for Error

- The furniture should minimize hazards and the adverse consequences of accidental or unintended actions. The furniture shall be so designed as to minimize the risk of injury to the user. All parts of the furniture with which the user comes into contact during intended use, shall be so designed that physical injury and damage are avoided.
- Furniture must be characterized by stability and strength to support unpredictable use of furniture [5].
- Avoid using sharp objects, which can lead to injuries.

**TIP:** Round the furniture edges. Available corners and protruding parts should be rounded, without burrs and sharp edges ( $R \geq 5$  mm) or chamfered 5 mm, angle  $45^\circ$ . There should be no open pipes. All other edges and corners of furniture, accessible during use shall be free from burrs and sharp edges.



A table with round edges by IKEA. Photo: Beata Fabisiak

### Principle 6: Low Physical Effort

- Furniture design should be effective and easy to use for users of different abilities. Promote good ergonomics by allowing users to maintain an optimal body position when using the furniture. Make sure using and reclining the furniture is as easy and comfortable as possible.

**TIP:** Use anthropometric atlases and guidelines indicating functional dimensions of furniture. Make sure chair offers an easy sit-to-stand transitions. Too deep seats cause slumping (posterior pelvic tilt). Armrests can provide comfort and allow easier entry and egress [6].

**TIP:** Provide furniture design that allows the user to maintain a neutral body position – for example a sit-to-stand desk.

**TIP:** Design furniture handles in a way to facilitate opening the cabinets also when using other body parts, such as an elbow.



3D-printed handles, developed at Satakunta University of Applied Sciences, Finland. Photo: Jakub Wittchen

**TIP:** Provide furniture elements that can be adjusted easily and effortlessly.



An adjustable sink in the kitchen of the exemplary AAL (Ambient Assisted Living) facility apartment in the Skaraborg Health Technology Centre in Skövde, Sweden. Photo: Jakub Wittchen

## **Principle 7: Size and Space for Approach and Use**

- Appropriate size and space is provided for approach, reach, interaction, and use regardless of the user's body size, posture, or mobility.
- Furniture is tested for safe and comfortable use by all, including morbidly-obese individuals.

## Other considerations

- Favour eco-friendly design and materials. The raw materials and technologies involved in each step of the product's life cycle starting from its design and up to its recycling.



Outdoor furniture made from scrap wood. Photo: Ryann Deloso

- Outdoor furniture has to exhibit high resistance to vandalism and weather conditions.
- Groupings of outdoor furniture elements can be established to create a sense of place.

**TIP:** Create a sense of place through thoughtful arrangement of furniture. For example, street furniture can create a separate space that can become a gathering place or focal point. The placement and selection of street furniture should allow the function of the space to be transparent and clear. [7]



Outdoor benches in the center of Jyväskylä, Finland serve as gathering points for visitors. Photo: Ryann Deloso

- Seating surfaces should have ample space between slats. This type of surface tends to dry more quickly after rain.



Outdoor furniture with slats. Photo: Ryann Deloso

- Surfaces are easily cleaned, with no surface joints or seams.
- Surfaces are nonporous and smooth.
- Materials suggest a link to nature.



Furniture and nature are beautifully linked together. Photo: Ryann Deloso

- Materials are sound absorbing.

## II. Guidelines for public institutions

A public space should provide opportunities for all users with different abilities to interact easily with the shared environment. Environments should be designed based on our dreams and aspirations and our right to happiness. This is to avoid creating an environment that meets only the minimal requirement and which only supports the survival of the user instead of the holistic need of the user. Having a dialogue not only with the users of the public space but also with the residents near the public space can help find solutions that are acceptable to all. A space intended to be friendly should look friendly as well with a touch of human soul and emotion. [5]

This chapter presents guidelines and hints on how to make various types of public spaces more senior-friendly and preferably all-age-friendly, employing the universal design principles.

### Principle 1: Equitable Use

- Provide the same means of use for all users: identical whenever possible; equivalent when not.

**TIP:** Entrances should be accessible to all and should not be reserved only for a specific group of users. Entrances and pathways should be used by all with equal dignity. [5]



The main entrance of Oodi Helsinki Central Library is accessible for all. Photos: Ryann Deloso

**TIP:** Offer a family toilet where either the father or the mother or grandparents can use when they are with a child [5].

**TIP:** An equitable playground that provides play and recreational opportunities for both younger and older visitors, allowing for multigenerational interaction and social participation of people with different abilities [8].



Hapelähde Park, a multigenerational park and playground in Kuopio, Finland. Photo: City of Kuopio / Vicente Serra.

- Avoid segregating or stigmatizing any users.

**TIP:** When possible, avoid creating different paths or access points for wheelchair users. When providing step-free options, try to place them near or beside the stairs.



Step-free option aesthetically connected to the stairs. Photo: Ryann Deloso

- Services should be accessible to everybody.

**TIP:** Provide different heights of reception desks so that also people of shorter heights or those using wheelchairs can approach them.



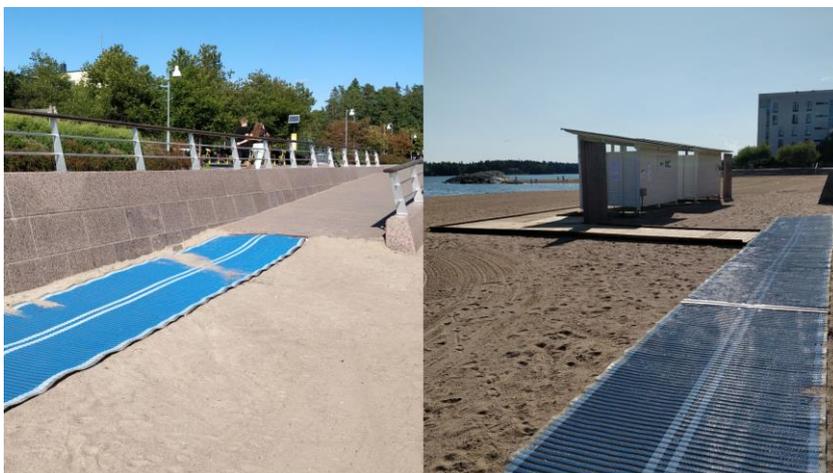
Reception area of The House of Disabled People's Organisations in Taastrup, Denmark. Photo: [www.handicap.dk/huset](http://www.handicap.dk/huset)

- Everyone must have a convenient and safe access to the entrance and exit of the public space.

**TIP:** Provide connections between the public space and pedestrian pathways [9].

**TIP:** Users of public spaces feel safer when there are several obvious exits [9].

**TIP:** Provide equitable access to a public space for wheelchair users.



Equitable access to the beach entrance. Aurinkolahti Beach, Vuosaari, Finland. Photos: Ryann Deloso

- Public furniture should be positioned in a way that it enables social engagement in public space to all without feeling isolated.

**TIP:** Ensure that wheelchair users can fit comfortably in the facility without feeling that they are excluded or positioned differently from other users.

## Principle 2: Flexibility in Use

- Flexible use of an environment gives people the opportunity to use their varying abilities as individuals and to choose personal preferences.

**TIP:** A height-adjustable desk could make the use of the environment flexible for all users allowing them to interact with the space while standing or sitting, such as wheelchair users [8].

- Users can choose preferable furniture options.

**TIP:** Provide chairs or sofas with armrests or backrest next to those without.

**TIP:** Provide options of furniture that accommodates users' side dominance.



Outdoor chairs with single armrest on different sides. Photo: Ryann Deloso

- Users can engage in activities and interact with the environment no matter what their ability is. Adding activities for visitors makes a public space attractive and vibrant and extends their stay in the public space. [9]



Jigsaw puzzle activity for visitors of Pasila Library, Finland. Photos: Ryann Deloso

- **Multifunctionality.** Space can be utilized for several usages simultaneously and also for one performance at various times and in different places by people of different ages, genders, and cultures.
- **Convertibility.** Possibility to add, reduce or combine elements and furniture.

**TIP:** If the furnished environment is designed to be modifiable by users, it should contain furniture that is light enough to be moved by the users.

**TIP:** If a public space already has benches without armrests, instead of purchasing new benches, an alternative is to add a stand to the side of the bench which offers support when sitting down or standing up.



A bench with a side stand in Mehiläinen Healthcare centre in Tampere, Finland.  
Photo: Anja Poberznik

### Principle 3: Simple and Intuitive Use

- Features or purpose of the space are easily understood by visitors with minimal user experience, knowledge, or language skills or current concentration level.

**TIP:** Utilize public signage with symbols and text that is easily understood by all.

- The design of a building should communicate the services it offers and supports their delivery [5].



Train station in Chorzow, Poland. Photos: Pete Kercher

The design of this station in Chorzow, Poland does not communicate what it is from the outside nor from the inside.

- Good orientation and way-finding/navigating which promotes independent use of the space.



Different coloured floor marks can ease the navigation in Meilahti Hospital (HUS), Helsinki, Finland. Photos: Ryann Deloso

**TIP:** Make use of tactile surfaces as a wayfinding solution for people who are blind. [10]



Tactile surface as wayfinding solution in Oodi Helsinki Central Library, Finland. Photo: Ryann Deloso

- Place a “standout” feature in the center of a public space that draws people into and through the space [9].

**TIP:** A big tree, a sculpture, or a water fountain could serve as a focal point that draws people to the center and could be a good reference point for navigation within the space [9].

**TIP:** Provide all possible pieces of information relevant to the visitors. Adding additional information e.g. that these are the last toilets is actually showing the visitors you really do care about their comfort.



Photo: Fredrik Haren, <https://www.linkedin.com/in/fredrikharen/>

#### Principle 4: Perceptible Information

- The necessary information is effectively conveyed regardless of the user's sensory capabilities - vision or hearing problems and other external factors such as noise or inadequate lighting.

**TIP:** A fenced-in wayside suggests to users that they cannot go beyond that area for safety or other reasons.



Vanhankaupunginkoski, Helsinki, Finland. Photo: Ryann Deloso

- General lighting has to be good, even and non-glare.
- Place lighting to allow safe movement and orientation.



Light posts around Esplanade Park, Helsinki, Finland. Photo: Mchael Poncardas

- Favour wide windows to invite natural light indoors and to lessen claustrophobia [5].
- The public space uses an induction loop for users with impaired hearing. The induction loop location is clearly marked.



Induction loop sign in The House of Disabled People's Organisations, Taastrup, Denmark. Photo: Laura Ozola.



A system of clear information pictograms, important for people with cognitive disorders, e.g. with dementia. Induction loop sign in the Center of Culture and Art in Konin, Poland. Photo: Marcin Halicki

- Avoid or reduce the echo in a (large) space.

**TIP:** Add art, tapestries and acoustic foam on the walls. Use plants and soft materials to reduce the echo.

- Colour and contrast differences make it easier to perceive the space correctly.

**TIP:** Having furniture in colours which contrast with walls and flooring helps people with dementia and sight loss to recognise where they are and to find their way around [10].

**TIP:** Use the yellow colour if it is intended to be grabbed quickly (handlebars in public transportation) [5].

- A guidance system should be logical: signs should be uniform and continuous.
- A map of the premises should be located adjacent to the entrance.

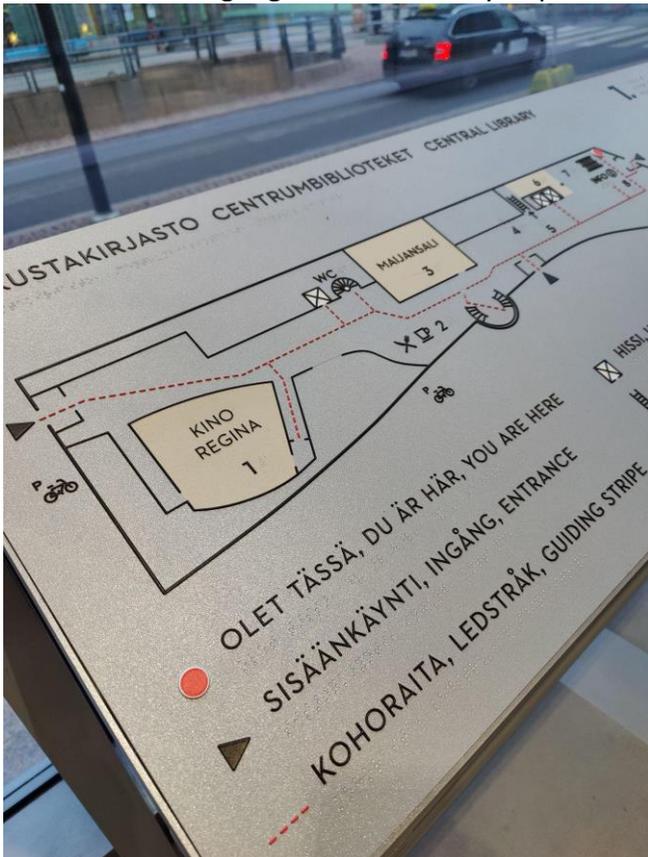
**TIP:** Make use of the “you are here” maps and tactile maps and models for better orientation and for direction.

- Signs should be illuminated. The surface of the signs is matt and non-glare.
- There is a clear tonal contrast between signs and the environment. Avoid colourful backgrounds underneath the text as it makes reading more difficult.



Black and white directory signage in Oodi Central Library, Helsinki, Finland. Photo: Ryann Deloso

- Provide Braille signage for the visually impaired.



Tactile floor map with Braille of Oodi Central Library Helsinki, Finland. Photo: Ryann Deloso



The braille engraved railing at Castel Sant'Elmo with the view of Mount Vesuvius in the background. Copyright @thegallowboob – Twitter, <https://www.euronews.com/travel/2021/08/18/accessible-tourism-why-this-braille-railing-in-naples-has-gone-viral>



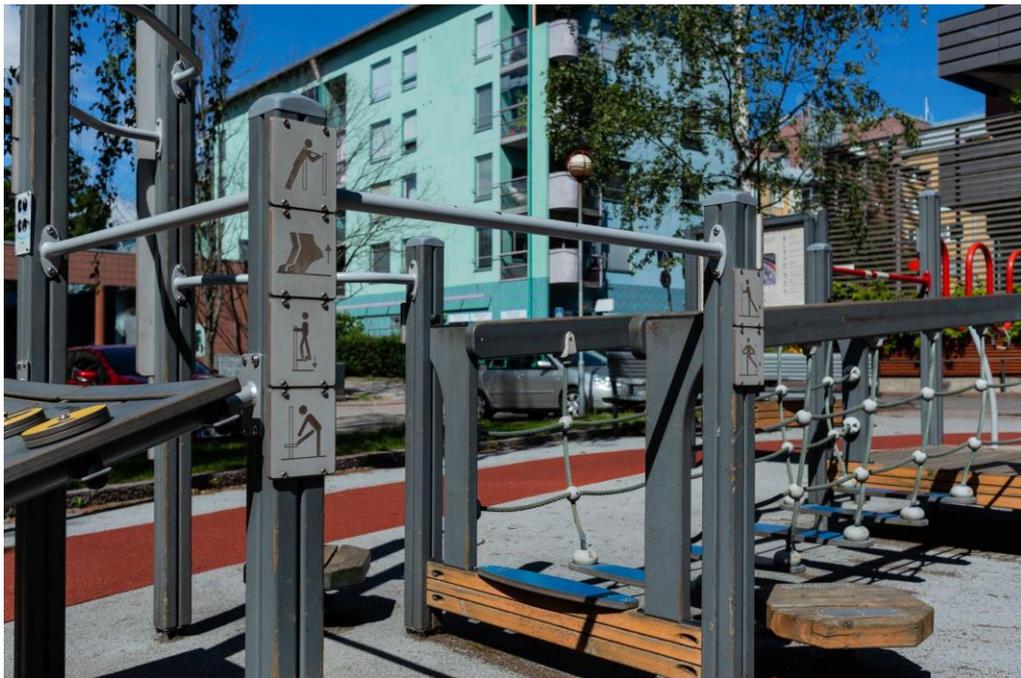
The railing at Castel Sant'Elmo with the view over Naples. Photo: Lidija Pisker, <https://www.euronews.com/travel/2021/08/18/accessible-tourism-why-this-braille-railing-in-naples-has-gone-viral>

- Simplify the language. Make information concise for the public so that it is easier to understand [5].
- In addition to text format, the public space can provide instructions and directions in the form of infographics and videos.

**TIP:** In making instructions, prioritize from top to bottom. Be careful in using italics for public notices and instructions. Some people might have difficulty reading them. [5]

- Images and symbols or icons are used to support the conveyance of messages. Images are kept simple and calm.

**TIP:** Icons should be clear and understandable to all. Use more inclusive icons that reflect the reality of our world. Icons should be meaningful for everyone and should be relevant in our current time. When using icons, be aware that they might not mean anything to some people. It is always good to consult the users. [5]



Clear and simple images showing the use of equipment in Taavetinpuiisto park, Helsinki, Finland. Photo: Ryann Deloso

- Use optimal font type, size, character spacing and contrast in your signage.

**TIP:** Choose fonts such as Times New Romans, Cambria, Helvetica, Arial, or Verdana.

- The language skills (incl. sign language) of customer service personnel are made visible to customers.

## Principle 5: Tolerance for Error

- Eliminate or reduce adverse consequences and the risk of unintended actions.

**TIP:** Soft fall playground flooring provides a cushioned surface in the event of a fall. This rubberized flooring makes fall accidents less dangerous.



Rubberized flooring of Taavetipuisto park, Helsinki, Finland. Photo: Ryann Deloso

- Avoid having dangerous areas in the public space or mark them visibly / use warning signs.

**TIP:** A hallway is free of protruding objects at a height where they would not be detectable by someone with a visual impairment.

**TIP:** Use visual and tactile warning surfaces [10].

- Colour and contrast can be used to highlight hazards.

**TIP:** Highlighting sharp edges with colour draws attention to the danger that they may pose.

**TIP:** Step edges that are contrasted to stair treads and risers improve safety by helping to visually reinforce the change from flat surfaces to steps [8, 9].

- Good illumination makes public spaces safer.

## Principle 6: Low Physical Effort

- The public space allows everyone to participate without discrimination of strength level.

**TIP:** Exercise equipment in public outdoor gyms must have adjustable resistance to accommodate different users with varying levels of strength abilities.



Exercise equipment in an outdoor gym in Vuosaari, Helsinki, Finland. Photos: Ryann Deloso

- Favour easy door opening, installing elevators in addition to stairs. Prefer automatic doors or doors that can be opened by pushing a button.

**TIP:** Option of foot operating elevator communication for individuals with poor hand function.



Lift at The Disabled People's Organisations House, Taastrup, Denmark which can be operated either by hand using an elevator button or by foot with a foot panel. Photo: Laura Ozola



Lift which can be operated either by hand using an elevator button or by foot with a foot panel. Photo: Emily Mount, <https://www.linkedin.com/in/emilymount/>

### Principle 7: Size and Space for Approach and Use

- Appropriate size and space is provided for approach, reach, interaction, and use regardless of the user's body size, posture, mobility, or disability.
- Provide enough space for safe movement and passage.

**TIP:** People who are blind tend to use the sides of the building to navigate through a path if there is no other existing wayfinding that they can use. Inappropriate placement of outdoor furniture on the sides of the building hinders them from using the path safely. [5]

**TIP:** Provide parking spaces for bicycles and electric scooters to keep them away from narrow footpaths in the city. Accessible parking is located as close to the entrance as possible. [5]



In the Disabled People's Organisations House, Taastrup, Denmark accessible parking spaces are located in front of the main entrance of the building. Photo: <https://www.handicap.dk/huset>

- Some solutions might have good intentions but if they are not properly thought about, they could compromise accessibility [5].

**TIP:** Having greenery along the edges of a building could hinder people who are blind to locate the sides of the building which they use to navigate the path safely [5].

- Ensure resting places throughout the space. Offer a range of seating options, including a table for someone who uses a wheelchair or wider chairs for individuals who are taller and/or larger. [11]
- Frequency of outdoor comfortable seating options with appropriate egress and ingress approximately every 60 metres in order to rest.



Ample benches in Esplanade Park, Helsinki, Finland. Photo: Mchael Poncardas

- The main entrance is easy to locate. It clearly stands out from the facade and is roofed and illuminated.
- Doors are easy to identify (stand out due to tonal contrast). Doors are wide enough to accommodate a variety of users.
- Instead of removing architectural barriers, we should consider creating new itineraries. Other entrances for accessible access if manipulating the main entrance would compromise the building's aesthetic property and integrity. [5]
- Surface of the pathways supports the weight of the user [5].

**TIP:** When gravel is used as the ground surface, it should be reinforced with sturdy material, such as metal screens, to prevent shoe heels or wheels from sinking [5].

### Other considerations

- When adding an accessible feature to an existing structure, such as a ramp on a historic building, make sure the added part looks good and sturdy and should aesthetically complement the visual impact of the overall environment [5].
- When adding accessible elements to a delicate structure, use the existing structure rather than creating an entirely new additional part. It is also good to create something removable to maintain the integrity of the existing structure. [5]

- When designing a space, accessibility should be considered already at the planning stage. Accessibility should not be an afterthought that ends up as a quick fix which could potentially ruin the entire environment. [5]
- Make use of technologies to make historical buildings accessible. Make use of ICT to improve accessibility and improve service delivery.
- Include vegetation in designing and creating a public space. Greenery do not only improve aesthetics and attract people, they can also combat the effects of climate change as they increase carbon capture and decrease urban heat. They also improve the quality of air and reduce noise pollution. [12]

**TIP:** In highly urbanized areas where horizontal expansion is a challenge, creating green walls or vertical gardens is a popular trend in adding vegetation in the city.



Vertical Garden in Ocean Financial Center, Singapore. Photo: Ryann Deloso

- Use pollinator-friendly plants for outdoor vegetation [13].

### III. Guidelines for the usage of ICT integrated and other smart furniture for elderly in public spaces

In the furniture industry, design of new products is a complex process that involves a synthesis of elements related to comfort, aesthetics and resistance. Furniture manufacturers face many challenges when designing and modelling new products. These include the difficulty in exchanging and sharing information with the shop floor, as well as with business partners, along the supply and sales chain. In addition, issues concerning sustainability and green design are becoming a very important part of the furniture design and production process. This is due to both regulation and the need for a more responsible usage of materials, combining social needs and responsibility with a creative interpretation of contemporary aesthetic concepts and the skilled use of production methods. The use of integrated, ICT-supported furniture design procedures can be a real competitive advantage in this sector, where most designers have an aesthetic rather than a technical background. [14]

ICT-integrated furniture is furniture that involves information and communications technology (ICT). ICT is an umbrella term that encompasses a wide array of systems, devices and services used for data processing (the information side of ICT) as well as telecommunications equipment and services for data transmission and communication (the communication side). [14] It may consist of technologies such as computers, sensors, radio frequency identification (RFID), voice communication et cetera. Such technology is often regarded as smart, thus ICT-integrated furniture is also termed smart furniture. Some examples would be interactive sense screen tables, heat sensitive tabletops, solar panel integrated benches, sound-systems embedded furniture, tech charging furniture and multimedia sofa tables.

Not all smart furniture, however, encompasses ICT or other technology. Some smart furniture possesses the characteristics of being easily transformable, adjustable, and adaptable with simple pulling or folding mechanisms, therefore enabling a space saving functionality. An example would be a sofa that can be pulled out into a bed and tucked away onto the wall not requiring power. Another example would be a dining table which can be closed and transformed into an ironing board. Yet another example are modular chairs or sofas that can be rearranged in different patterns, thus serving a variety of uses. Whether the furniture involves technology or not, it is important to remember that the furniture should serve its primary purpose as a furniture and therefore value functionality, comfort and elegance to fit the public space in which it is implemented.

ICT integrated and other smart furniture should follow the same principles of universal design as regular furniture. Below are collected guidelines related to ICT integrated and other smart furniture as an addition to the principles of universal design.

- **Multiprofessional co-design.** To best benefit the end user, designing smart furniture should involve professionals from various fields, e.g. ICT, healthcare, furniture and design. In addition, it is beneficial to involve the end-user in the development process. [15]
- **Intuitive use.** Smart furniture has to fulfill its primary purpose (primary role as an item of furniture). ICT solutions must be independent of the physical furniture. In this way, the main intuitive function is preserved, while the furniture can accommodate various smart solutions. [15]

**TIP:** A table still serves as a table even without the embedded touch-screen feature.



A coffee table. Photo source: <https://www.wooden-furniture-store.co.uk/>

- **Benefit/Added value.** Smart furniture should bring added value to the user and the public space.



Solar-powered bench with Wi-Fi access and a phone charging station. Photo: <https://www.helen.fi/en/news/2018/solar-panel-benches-in-helsinki>

- **Optimal positioning.** Implement intelligent design solutions which provide maximum usage of a given space and provide maximum compactness for storage when not in use.

**TIP:** Avoid reflection-prone surfaces (e.g. screens or mirrors). Position furniture which incorporates screens to reflection-free areas.

- **Customization.** All the properties of the furniture can be modified based on the specific needs of the customer, ranging from selecting the desired colour, material and up to shapes and sizes. End-users' needs may vary depending on whether the smart furniture is used in a private (home) setting or in a public space.

**TIP:** ICT solutions should be tailored according to where the furniture will be used. When in public spaces, ICT solutions should not collect and process personal data.

- **Modularity.** The design should employ multiple, simple, interchangeable components which can be easily combined in a variety of ways to adapt to the specific user requirements.



Modular and multifunctional furniture by Parkly in Kalasatama, Helsinki, Finland. Added sensors measure weather conditions such as temperature, humidity in air and soil, irradiation and pressure. The sensors also sense movement and can detect use of space and ambient noise. [13]

- **Multifunctionality.** The smart furniture should employ the capacity to fulfill at least two functions with minimum effort and time spent to switch between configurations.

**TIP:** Furniture can be equipped with sensors that promote health. For example, a chair could be equipped with sensors that measure sitting time or the pressure being exerted when standing up. Sensors can be utilized in combination with exergames to encourage physical activity among users.



Foto: S.B. Skille

ReAble Chair prototype, developed by Norwegian University of Science and Technology, Trondheim, Norway within BaltSe@nioR project.

- **User interaction.** Favour simple user interaction with technology.

**TIP:** As there is a bigger flow of visitors in public spaces who spend less time in a public space compared to a home environment, smart furniture should be immediately ready to use accompanied with clear instructions on how to operate it.

**TIP:** Seniors' perception of sensorial feedback might be affected by physical problems associated with aging. The accuracy of perception towards pressure, vibration, spatial acuity, roughness, length and orientation might be compromised. When incorporating vibro-tactile signals, adding mechanical noise to the system could make vibrating alerts more perceptible for seniors. [16]

- **Learnability:** The ICT system in furniture should be easy to learn, making the furniture easy to use. Preferably, training would not be required and the interface would be self-explanatory. [16]
- **Buttons' colours and contrasts.** When there are clickable buttons, they should be different colours as the device casing and should have good contrast against the device [17].
- **Modified contextual use.** Contextual use of appliances and furniture can be challenging for an elderly user who might have less physical flexibility due to aging [17].

**TIP:** Electrical outlets are typically located on the floor or on the lower portions of the wall near the floor. Seniors who cannot bend over and whose dexterity is limited may find it difficult to operate an appliance or piece of furniture that needs to be plugged into the outlet. This contextual use of furniture and appliances should

be redesigned to facilitate the use of appliances and furniture for seniors or others without bending over. [17]

- **Comfort.** The ICT solutions should not compromise the comfort of the furniture, and they should support accessibility. New, innovative, and active designs for ICT-integrated furniture must focus on human health and ultimately provide greater comfort, ease, and convenience for all users, especially seniors. [15]
- **Materials.** The choice of materials in smart furniture must be compatible with the whole system and should not interfere with the furniture's desired functions.

**TIP:** Avoid using materials that prohibit or intensify electrical flow or wireless signals.

- **Safety.** Provide fail safe features. ICT components should be hidden, isolated and shielded from external factors (e.g. weather). Administrative components of the software should be removed from the end user's interface (UI) and integrated into a separate UI.
- **Clear and understandable error messages.** Committed errors must be presented immediately and in plain language (no codes). It should indicate the problem clearly and concisely. An error message should also include easy, constructive, and clear solutions. [16]
- **Security.** Ensure a broad spectrum of properties such as secure locking mechanisms for modular furniture and optimal balance mechanisms for wall mounted space saving furniture.
- **Data protection.** Ensure data protection for ICT components that collect data.
- **Technical support.** Technical support should be provided and easily accessed by the user of the public space.

## CLOSING NOTE

We would like to note that the guidelines are not a result of extensive scientific research but rather a collection of lessons learned during the BaltSe@nioR and BaltSe@nioR 2.0 projects between 2016-2021 that we would like to share. We hope that the guidelines serve as an inspiration when building a new public space or renovating an existing one, creating new furniture or adapting the existing one, with or without the smart features.

The guidelines include practical hints that can be used by the institutions to ensure creation of senior-friendly public spaces. The manufacturers are able to follow those guidelines in designing and producing furniture to increase their capacity of creating products meeting the needs of seniors in the public spaces. The document can serve as a knowledge source that can be a support in the decision making process on choosing the pieces of furniture that will allow for creation of senior friendly public space and thus help public institutions to provide more accessible services for the citizens.

We are convinced that by sharing the knowledge and experiences across the borders we can create friendly public spaces for everyone for now and for the future.

## ADDITIONAL SOURCES

In this chapter you can find a collection of publications, specific guidelines and hints that accompany the aforementioned guidelines. Each source includes a short description and a link to the website or online file location.

### **Universal design**

Language: English

Description: How we can enable the design of environments, products, services, and technology to be accessed, understood and used regardless of a person's age, size, ability or disability.

Available on: [Universaldesign.ie](http://Universaldesign.ie)

### **Housing Design for All? The challenges of ageing in urban planning and housing design – The case of Helsinki**

Language: English

Description: Urban planning and housing design should consider all residents, especially the senior ones to be able to create a neighbourhood that is accessible and attractive for all. With all the health issues that come with ageing, seniors should be supported in performing their daily activities to maintain their well-being. This doctoral dissertation presents cases of outdoor and indoor designs in Helsinki region which support activities of daily living of senior residents.

Available on: [Aaltodoc.aalto.fi](http://Aaltodoc.aalto.fi)

### **Toilet Talk 2 file**

Language: English

Description: In most public spaces, less attention is given to toilets when it comes to their accessibility for older people especially those with dementia. The modernization of toilets has rendered some of them inaccessible for older users. This book presents both bad and good examples of public toilets which could help improve toilets' accessibility for seniors. An accessible toilet is a big factor for encouraging seniors to live an active life and be able to enjoy being outside.

Available on: [Dementiacare.com](http://Dementiacare.com)

### **Accessibility Guidelines for Public Libraries**

Language: English

Description: Public libraries in Finland have been complying to the accessibility requirements by the law in terms of their physical structures. However, due to the development of services of libraries in recent years, accessibility of services has become an issue that libraries must tackle to be able to equally serve everyone regardless of any limitations. This guide is the result of collaborative work of a group of active members representing a range of projects financed by the Ministry of Education and Culture. This serves as a guide for libraries to implement a genuine accessibility of services.

Available on: [Celia.fi](http://Celia.fi)

### **Design standards for urban infrastructure: 19 street and park furniture and barbecues**

Language: English

Available on: [Cityservices.act.gov.au](http://Cityservices.act.gov.au)

### **The Dementia Enabling Environment Virtual Information Centre**

Language: English

Description: An enabling environment will encourage a person with dementia to live as full and independent a life as possible. The Dementia Enabling Environment Virtual Information Centre suggests practical tips, guides, and resources to help make the built environment such as the home, care facilities, gardens, public buildings, and hospitals more dementia friendly. The solutions are based on evidence-based principles and were created based on a review of research literature on studies that address maximizing the opportunities and well-being of people with dementia through physical design.

Available on: [Enablingenvironments.com.au](http://Enablingenvironments.com.au)

### **Helsinki kaikille: CITY OF HELSINKI ACCESSIBILITY GUIDELINES 2011**

Language: English

Description: The city of Helsinki has established a project called “Helsinki for All” during 2002-2011 which aimed to improve and promote accessibility of the entire city. Part of the project is an outline of accessibility guidelines to which comments from councils for the seniors and people with disability have been taken into consideration. The result of that project is the City of Helsinki Accessibility Guidelines (2011) which promotes accessibility in all works undertaken by administrative branches of the city government. These guidelines cover land use planning and traffic planning, buildings, public areas, residential environment, and services.

Available on: [Hel.fi](http://Hel.fi)

### **Designing for high-needs elderly**

Language: English

Description: A study conducted in New Zealand on designing housing environments for high-needs seniors resulted in a set of housing design requirements that enhance every aspect of quality of life for an older adult living at home. In this study, the researcher has identified 6 themes for quality of life (independence and control in daily activities, meaningful leisure activities, meaningful relationships, maintenance of possessions, comfort and quality of care) and matched them to design elements.

Available on: [Buildmagazine.org.nz](http://Buildmagazine.org.nz)

## Sources in other languages

### **Program for creating age-friendly municipalities**

Language: Swedish

Uppsala and Stockholm are municipalities in Sweden that have developed programs to create age-friendly municipalities based on goals in Agenda 2030 (Uppsala) and criterias from WHO regarding characteristics of an age-friendly municipality (Stockholm). These programs are aimed to fulfill several goals for sustainable development of the municipality to preserve wellbeing, healthy and active aging and a meaningful life in all ages. The variation in needs and the desire to remain

independent as long as possible is acknowledged and an effort is made to adjust the structure and services in the society accordingly. When needed, health and social care are provided preserving the senior's integrity, independence and dignity.

Available on: [Program för äldrevänlig kommun.pdf](#)

Available on: [Strategi för en äldrevänlig stad.pdf](#)

### **Barrieren in Stadtquartieren überwinden**

Language: German

Description: This brochure examines the spatial and social dimensions of accessibility as well as goals and contradictions in handling and dismantling of barriers in the city quarter, in the residential area, in open spaces and in communal facilities. This brochure is intended for people who design city quarters, supplemented by case studies as the focus of the practical examples.

Available on: [Demografie-portal.de](#)

### **ESKE kartoitusopas**

Language: Finnish

Description: An accessible and functional environment supports the well-being of people within a community. Such an environment also offers opportunities for everyone to participate and influence, regardless of their physical condition. "ESKE Kartoitusopas" is a guide for accessibility surveyors, for training, for conducting mapping and mapping reports in accessing accessibility of a space. It is also a source of information for anyone who wants to know about accessibility of a built environment.

Available on: [Invalidiliitto.fi](#)

### **Palvelualueen ja ikäystävällisen asuinalueen kehittäminen**

Language: Finnish

Description: The Finnish government aims to support seniors to be able to live at home as long as possible. This requires significant development of housing and living environments in the areas of accessibility and safety. This report addresses the development of seniors' living environments according to their needs.

Available on: [Helda.helsinki.fi](#)

### **Sujuvampi arki ikääntyville**

Language: Finnish

Description: It is estimated that by 2030 more than 26% of the Finnish population will be 65 years old and older. This issue obviously impacts the social and health sectors however, in reality, its impact goes further than that. The physical living environment, for example, should be created to be inclusive for seniors to promote their living condition and their well-being. This guide aims to raise awareness among different stakeholders from various fields to see their own possibilities in creating a living environment where seniors could participate as productive and active members of the community.

Available on: [Sujuvampi arki ikääntyville.pdf](#)

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