

# SHIP Project: designing inclusive, accessible, and sustainable urban parks

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**Abstract.** Urban green areas are of fundamental importance for the mental and physical well-being of citizens. However, these areas are often designed without considering the needs of all users, especially people with disabilities and the elderly.

To fill this gap, the SHIP project aims at designing and developing urban furniture, rides, and tools for physical activity and leisure to make a public park inclusive, accessible, and sustainable. Sustainability is intended from both an environmental and social point of view. Considering the former, recycled materials will be used. Regarding the latter, the design will include every potential target visitor in the logic of inclusion, accessibility, and social safety. Here we mainly describe the first phase of SHIP, characterized by activities of participatory design. In particular, to understand users' needs, expectations and to collect design requirements, a series of Focus Group sessions were conducted, involving users with disabilities, the elderly, and their caregivers.

Findings showed habits and preferences of the target users related to public parks and their equipment, e.g., urban furniture. The main issue that emerged concerned the inclusiveness and accessibility of urban green areas. Indeed, participants highlighted the presence of physical barriers and the separation between areas for all and zones for people with disabilities, which severely limited the process of socialization. Furthermore, users showed enthusiasm in being involved directly in suggesting potential solutions regarding supplies, playground, sports, and well-being aspects. Finally, we report a set of preliminary design guidelines for outdoor recreational settings.

**Keywords:** Inclusiveness, Accessibility, Participatory Design, Environmental Sustainability, Urban Park

## 1 Introduction

Spending time in natural environments has a regenerative value for all individuals, regardless of their age, provenance, and level of physical ability. This becomes even more important for people living in urban environments, where the landscape is dominated by concrete, artificial constructions, and city parks can be a true oasis [1, 2, 3]. Unfortunately, too often city parks are designed and developed considering able-bodied individuals and not people with disabilities [2]. Indeed, mobility barriers can be found in urban environments but also in natural areas, making people with disabilities feel out of place [4].

In the present work, we describe the SHIP project, which is meant to realize inclusive and accessible urban furniture, rides, and tools for physical activity and well-being for parks implementing the philosophy of environmental and social sustainability. To this end, the project will follow a Participatory Design (PD) approach. Here we report the initial stages of the project, which consisted of participatory activities carried out with users and stakeholders. In particular, users and stakeholders are involved in the process of designing and developing accessible and inclusive artifacts to create a path that is suited to their needs, requirements, and expectations.

The remainder of the paper is organized as follows: first, we introduce the SHIP project. Next, the most common accessibility issues to natural environments are described along with the usage of PD techniques to involve users with disabilities and the elderly in the design process. The description of the methods, experimental sample, and procedure follows. Finally, we report the findings and concluding remarks.

## 2 The SHIP Project

### 2.1 Project description

The main goal of the SHIP project is to develop equipment and technologies for parks to encourage the implementation of actions and practices of environmental, social, and cultural sustainability. In this framework, the park is no longer considered a simple place for purely aesthetics and passive use, rather as a space to build new educational models and actions aimed at citizens' psychophysical and social well-being.

Overall, it is intended to create an experimental path in an urban park featuring prototypes of inclusive urban furniture implemented during the project. The path will be highly accessible to all categories of users: users with different levels of motor, cognitive, and sensory disabilities, but also enjoyable and pleasant for their companions and other users. Moreover, the objects will be made out of recycled and reused materials, following the circular economy's criteria and full respect for environmental sustainability.

In addition, end-users will actively participate first in design and then in the prototype evaluation phases, considering aspects related to user experience and usability. The results that will be obtained will help project partners to eventually redesign the prototypes for the subsequent evaluation phases.

The project features a multidisciplinary consortium of partners. More specifically, academic experts in Human Computer Interaction and biomedical science, will be responsible for the PD activities, to inform the proper design of the pieces of furniture, and to evaluate the prototypes. A daycare center for older adults and individuals with disabilities will be in charge of building contacts and recruiting target users. Several companies will participate as well, to share their know-how on the waste material recycling, the production of pieces of furniture made of sustainable wood, and to realize urban furniture with an aesthetic value.

## **2.2 The (in)accessibility of natural environments**

Natural environments, such as countryside, city parks, and woodland, are a precious resource for both the physical and mental well-being of individuals. More specifically, individuals with disabilities visit natural environments not for rehabilitative purposes, rather for leisure, restoration, and recreative activities [3, 4]. While organized outdoors activities typically can rely on resources and assistance that facilitate access and participation, informal outdoors activities, e.g., a simple walk at the park, are less supported [4].

Additionally, attending natural environments can also foster socialization and facilitate social bonding [4]. However, if the outdoor environment is not designed to be socially inclusive, the chances of interacting with others can be severely compromised [2].

Previous research highlighted that non-urban settings could present concrete hazards for wheelchair users related to the surface and steepness of the path on which the wheelchair rides, obstacles (e.g., curbs), and transfers from the wheelchair to another seat and vice versa [5]. While insightful, these findings were obtained using a questionnaire administered to individuals with impaired mobility, thereby failing to deepen their concerns and desires. Furthermore, to design inclusive outdoors, it is crucial to fully comprehend the context, the abilities of target users, how they interact with the environment, and what makes the environment enjoyable or hard to reach [4, 6].

## **2.3 Participatory Design**

Participatory Design (PD) approach endorses the direct and active involvement of end users as an integral part of the design team. The contribution that PD activities can provide are especially valuable when designers, researchers, and target users do not share the same background, skills, and habits. Moreover, the resulting product is likely better received and accepted by end users, especially if they have disabilities [7]. This perspective aims at bringing target users' voices into the design process by giving them the role of experts in their own life experiences [6]. Traditional PD tech-

niques may not be fully effective when applied with users with disabilities. Indeed, if a particular technique relies on an ability that is compromised for that specific user group, then users' effort is likely to be out of focus [8]. So far, several research works have adjusted traditional PD techniques to better involve different groups of users with disabilities and the elderly. All these methods entail the co-participation of target users, either older adults, and individuals with intellectual and/or motor disabilities, in the same environment with the researchers (e.g., [9, 7, 10]). Sharing the same setting is undoubtedly advantageous for building mutual knowledge and trust with users and facilitate the comprehension of their requirements and habits. However, after the outbreak of the SARS-CoV-2, these user groups must rigidly attain to the new behavioral regulations to prevent contamination and risk for their own health. Therefore, we have organized Focus Group (FG) sessions online involving children and adults with motor disabilities, their caregivers, older adults, and relevant stakeholders. The aim of the activities was to understand what motivates participants to visit urban parks and what are the main issues/barriers they typically encounter in these outdoors areas.

### 3 Co-design activities

#### 3.1 Online Focus Group

The online FG sessions were conducted on the Zoom web platform. Participants were trained and supported to use the platform by the educators of the daycare centers. For those who needed more support, the operators attended the session at the participant's place to provide full assistance and facilitate attendance. In such cases both individuals wore protective masks.

**Sessions.** Three FG sessions were run, each involved a different target user group. More specifically, one session addressed adults with severe motor disabilities and their formal caregivers, a second one included children with severe motor disabilities and their informal caregivers, and finally older adults took part in a third session. Relevant stakeholders were present at all the sessions. One moderator led the group discussion supported by two observers.

The FG sessions had an average duration of 1 hour and a half. The entire sessions were video recorded to allow offline analysis.

**Ethics.** Before each session, participants received an Informed Consent form describing the aim of the activity, the data collection process, and data management, storage, and protection policy. Educators of the daycare center facilitated the process of obtaining consensus helping participants in filling out the documents. The form also included a short demographic questionnaire.

**Target users.** The first FG session was attended by adults with mild cognitive impairments and severe motor disabilities ( $n = 4$ ) and two professional caregivers who

were employed as educators at the daycare center ( $F = 2$ ; average age = 27.5,  $SD = 3.54$ ) (Fig. 1). All of the end users ( $F = 2$ ; average age = 37.33,  $SD = 11.69$ ) reported to use a mobility aid (i.e., wheelchair).



**Fig. 1:** Online FG session with adults with disabilities.

The second FG session (Fig. 2) was attended by children with severe motor disabilities ( $n = 2$ ) and their informal caregivers ( $n = 3$ ), that are their parents (Fig. 2). Target users ( $F = 2$ ; average age = 8,  $SD = 1.41$ ) needed mobility aids (i.e., wheelchair), and one also uses a tripod or walker.



**Fig. 2:** Online FG session with children users with disabilities.

Finally, a group of older adults ( $n = 4$ ) participated in the third FG session (Fig. 3). The target users ( $F = 3$ ; average age = 73.75,  $SD = 8.22$ ) were 3 people who do not use any mobility aid and one who uses a walker.



**Fig. 3:** Online FG session with elderly users.

**Procedure.** At the beginning of the session, the moderator introduced him/herself and then briefly described the purpose and the rules of the discussion, along with the principles guiding the project in terms of accessibility, inclusiveness, environmental and social sustainability. The moderator then introduced the observers and explained their role in the discussion. After that, participants were invited to introduce themselves one by one, and the moderator asked opening/ice-breaking questions to create a familiar atmosphere.

Overall the topic was approached following the so-called funnel approach [11]. The moderator first made introductory questions, asking participants to recall recent episodes where respondents visited an urban park (e.g., Which park do you typically go to? Who do you go to the park with? What do you do at the park?). These questions were meant to investigate participants' habits. Next, several aspects related to the motivation for visiting or not visiting parks were explored. Then, participants were asked to reflect on what is currently missing in parks to serve their needs and what they would like to see in parks.

Participants were asked how they would imagine accessible and inclusive urban furniture (e.g., benches, tables), paths, and equipment for wellness and leisure. To facilitate participants' focus on the actual topic, they were shown some pieces of furniture that meet accessible and inclusive principles. More specifically, the moderator shared the screen and displayed the images of some objects (selected and adapted for the different sessions according to the users' characteristics) and described their structural and functional features. Then s/he asked for participants' opinions and preferences.

In the final phase of the FGs, the moderator summarized what emerged during the meetings. This overview was followed by a final question for feedback and possible further reflections on potential aspects not yet explored during the FGs.

Throughout the session, the moderator committed to engage each participant in the discussion, calling them by name and inviting to share their view.

After the sessions that involved young individuals, participants were e-mailed a follow-up questionnaire. The questionnaire included the images of accessible and inclusive rides or tools for entertainment that were illustrated during the corresponding sessions. Participants were asked to score their preference for each item on a 10-point scale, where higher scores indicated stronger preferences.

### 3.2 Results

The videos of the sessions were analyzed by the observers (three researchers) to identify the most relevant themes. More specifically, each researcher examined the videos and his/her notes independently and listed the more relevant and more frequent themes that emerged in the FGs. Next, the researchers revised the three lists of topics and negotiated a unique list [12] which is reported below (Table 1).

Overall the participants in the three sessions actively contributed to the discussions and for many themes they reported similar answers or concerns. In general, the user group highlighted that the parks lack of accessible paths and inclusive and attractive equipment.

None of the participants goes to the park on their own; they go either with friends, family members, or educators (only for adults with motor disabilities). The activities undertaken vary based on participants' age: impaired adults mainly chat, children play and older adults play with their grandchildren. Nevertheless, all participants in the three user groups reported similar issues when using urban furniture. The height of tables is inadequate for wheelchairs, and benches do not allow to accommodate wheelchairs users and able-bodied individuals. Older adults also pointed out the lack of inclusive equipment that can be enjoyed with their grandchildren or with their peers. Another issue that concerns wheelchair users is the quality of the paving: participants complained that wheelchairs are unstable and hard to control on the grass or on loose gravel. Additionally, uneven paving can make it dangerous to ride a wheelchair because it can gather too much speed. Children's caregivers complained that playground equipment does not accommodate wheelchairs, thereby forcing them to transfer their children from the wheelchair to the equipment.

To overcome the issues reported above, participants suggested introducing tables with adjustable height and the possibility to adapt the distance between the table and the seat. Additionally, the tables should be circular and with center column to allow the accommodation of wheelchairs and foster socialization. Regarding the benches, participants claimed that they should be inclusive allowing both able-bodied individuals and wheelchair users. More specifically, they suggested that the bench should feature either movable seats that can create spaces for wheelchairs, or an empty space in the middle for a wheelchair. Older adults also proposed that the bench should feature specific elements to facilitate them while standing up, i.e., an armrest, a proper height (i.e., sufficiently high), and inclination of the seat.

Finally, age influenced the preferences concerning the type of equipment: older adults were more interested in equipment for gentle exercises that can be used with peers or grandchildren, and that can train various physical abilities (e.g., balance, strength). Participants with motor impairments showed a higher interest in playground equipment (e.g., slide, swing with seat).

**Table 1:** relevant and frequent themes emerged in the FG sessions.

<b>Topics</b>	<b>Adults with cognitive and motor impairments</b>	<b>Children with disabilities</b>	<b>Older adults</b>
With whom you visit the park	<ul style="list-style-type: none"> <li>• Friends (groups of 2/3 people), family members or educators</li> </ul>	<ul style="list-style-type: none"> <li>• Friends, family members</li> </ul>	<ul style="list-style-type: none"> <li>• Sons, friends' sons, grandchildren</li> </ul>
Activities at the park	<ul style="list-style-type: none"> <li>• Chatting</li> </ul>	<ul style="list-style-type: none"> <li>• Rides (slide and swing)</li> <li>• Playground with sandpit</li> <li>• Inflatables (with caregiver difficulties)</li> </ul>	<ul style="list-style-type: none"> <li>• Playing with grandchildren</li> </ul>
Negative aspects of the park	<ul style="list-style-type: none"> <li>• Tables too high to accommodate wheelchairs (both manual and electric)</li> <li>• Benches without space for wheelchairs</li> <li>• Mobility of the wheelchair hampered</li> <li>• Absence of paths to move safely</li> </ul>	<ul style="list-style-type: none"> <li>• The size of tables and benches unsuitable for wheelchairs</li> <li>• Uneven paving complicates the control of the wheelchair</li> <li>• Mobility of the wheelchair hampered</li> <li>• Difficulty in accessing playground</li> <li>• Caregivers' difficulty transferring children from a wheelchair to game equipment</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of objects suitable and attractive for older adults</li> <li>• Obstacles to mobility (e.g., pebbles prevent the use of walker)</li> </ul>
Preferred solutions for play-ground/fitness equipment	<ul style="list-style-type: none"> <li>• Basket swing with seat belts (operator support)</li> <li>• Garden tub</li> <li>• Labyrinth, a path to learn how to control the wheelchair</li> <li>• Slide</li> <li>• Blackboard for leaving messages</li> <li>• Magic mirror</li> </ul>	<ul style="list-style-type: none"> <li>• Basket swing (no wheelchair and with friends)</li> <li>• Round sandpit</li> <li>• Spring rides (no wheelchair)</li> <li>• Slide</li> <li>• Whiteboard for leaving messages</li> <li>• Magic mirror</li> </ul>	<ul style="list-style-type: none"> <li>• Equipment usable in groups (e.g., with peers or grandchildren)</li> <li>• Equipment to train shoulder stability tools with adjustable resistance</li> <li>• Exercise Bike for Upper Limbs</li> <li>• Adjustable rotating platform to improve balance</li> <li>• Multi-exercise station for lower limbs, back, and shoulder</li> </ul>
Potential solutions for urban furniture	<ul style="list-style-type: none"> <li>• Bench with proper space to accommodate a wheelchair in the middle</li> <li>• Bench with a movable seat to make space for wheelchair</li> </ul>	-	<ul style="list-style-type: none"> <li>• The height of the bench seat should be high enough to facilitate standing up</li> <li>• Armrests on the bench to facilitate standing up</li> <li>• Round table to foster socialization</li> <li>• Adjustable distance between seat and table</li> </ul>



## 4 Discussion and Conclusion

In the present paper, we described the SHIP project and reported on the initial Participatory Design activities that have been conducted to inform the design and development of accessible and inclusive urban furniture, rides, and tools for physical activity and well-being to equip a park following a perspective of environmental and social sustainability.

Different groups of target users, adults and children with severe motor disabilities and their caregivers, and older adults actively participated in online Focus Group sessions. Our findings indicate that the lack of accessible and inclusive facilities and infrastructure is the main reason for reducing the motivation of these individuals with disabilities and the elderly to visit urban parks more frequently. These places not only serve a restorative function but also foster socialization [4]. This limitation may severely compromise the opportunities of interacting with other people.

In addition, participants highlighted the importance of equipment that can be used by all users regardless of their individual and physical abilities. This aspect referred to the equipment for light physical activity and playground to be accessible, inclusive, and enjoyable by older adults and their grandchildren, and to urban furniture that should accommodate individuals with various levels of motor abilities. Such a configuration would foster not only physical but also social inclusion [2].

We found that using a wheelchair in a park can be dangerous, especially because of the characteristics of the paving (i.e., paving material, steepness), thereby highlighting that proper paths are a crucial aspect to make the park truly accessible. This outcome expands previous findings, that categorized potential hazards [5].

Finally, this work also contributes to design guidelines for outdoor recreational environments. To equip an inclusive park, it is necessary to consider three different categories of tools: *Supplies*, *Playground*, *Physical Activity & Well-being*.

The *Supplies* category includes basic furnishings which comprehend inclusive facilities that allow users to reach the different areas of the park, meet, sit, eat and drink and take shelter from the sun and bad weather. In particular, the park areas must be easily accessible thanks to a pavement that does not hinder the passage of walking aids. The paths of the parks must be as flat as possible, to facilitate the control of walking aids by users. In addition, tables must have adequate (or adjustable) height to allow wheelchair users to use them, and benches and chairs must provide adequate (or adjustable) space to allow for the accommodation of a wheelchair or other walking aids. In addition, the seats must include aids (e.g., armrests) to help users sit down and resume an upright position and must be sloped to facilitate the transition from sitting to standing.

The *Playground* category includes equipment that must include adequate safety measures (e.g., belts) to secure the user to the structure and allow the user who needs walking aids to position himself on the tool independently or with minimal effort by the caregiver. Moreover, they must also be able to accommodate wheelchair users.

Finally, in the *Physical Activity & Well-being* category we find tools used to train specific functions that are suitable for adults, the elderly, children and users with disabilities. Physical activity equipment aimed at creating inclusive and accessible “life” trails must aim at training balance, mobility, the strength of the upper and lower limbs, and the core (muscle district that includes abdominals and erector spinal muscles). In addition, the equipment must include adjustable handlebars and grips to suit users of different sizes (e.g., height, shoulder width). Moreover, they must be capable of being used without the supervision of a professional (i.e., non-medical equipment). Finally, it must include mechanisms that are not susceptible to wear and tear and require minimal maintenance (e.g., rails are preferable to gears).

These guidelines will serve as a valuable source of information for the designers and developers that are part of the project consortium. Besides, additional online Focus Groups are already scheduled, recruiting individuals with disabilities and the elderly, to gather additional information from these categories of end users. Finally, expert consultants in design of outdoor environments and in biomedical science will be involved in the overall design and development process of aesthetically pleasant and highly accessible, inclusive, and sustainable tools.

#### ACKNOWLEDGMENT

This work was partially supported by the POR FESR 2014-2020 Work Program of the Veneto Region (Action 1.1.4) through the project DGR n.711 titled “SHIP - Sustainable, Healthy and Inclusive furniture and games for Parks”.

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