PROJECT

REINFORCING PROTECTED AREAS CAPACITY THROUGH AN INOVATIVE METHODOLOGY FOR SUSTAINABILITY

The Project is co-funded by the the European Regional Development Fund (ERDF) and national funds of the participating countries

Interreg
Greece-Bulgaria
BIO2CARE
European Regional Development Fund

EUROPEAN UNION

NATIONAL CONFEDERATION OF DISABLED PEOPLE

Guidebook for Accessible Nature Trails

Design Guidelines and Evaluation System

PHOTO: RIVER-EDGE FOREST, NESTOS RIVER (CREDITS: MUNICIPALITY OF NESTOS)

GUIDEBOOK FOR ACCESSIBLE NATURE TRAILS

Published by the National Confederation of Disabled People (NCDP) of Greece, in the context of the "Reinforcing protected areas capacity through an innovative methodology for sustainability" project, better known with the acronym BIO2CARE. The Project is implemented in the context of the Cooperation Programme Interreg V-A Greece-Bulgaria 2014-2020 and is co-funded by the European Regional Development Fund (ERDF) and national funds of the countries participating in the Programme.

The design and production of the content of the Guidebook was awarded to EUROPRAXIS Single Member P.C., following a tender.

NATIONAL CONFEDERATION OF DISABLED PEOPLE

Headquarters: 236 E. Venizelou Street, 163 41 Ilioupoli, Athens, Greece

Tel: +30 210 99 49 837
Email: esaea@otenet.gr
Website: www.esaea.gr

EUROPRAXIS Single Member P.C.

4 Vergas Street (entrance) & 251 E. Venizelou Street, 176 73 Kallithea, Athens, Greece

Tel: +30 210 95 21 313
Email: info@euro-praxis.com
Website: www.euro-praxis.com

For further information about the BIO2CARE Project and the Interreg V-A "Greece-Bulgaria 2014-2020" Cooperation Programme, see www.bio2care.eu/en.

CONTRIBUTORS

Scientific Head: Sofia Mizamtsi

Physical/Conventional Accessibility Expert: Marily Christofi

e-Accessibility Expert: Alexandros Mourouzis

Design & Editing: Alexandros Mourouzis

Translation in English: Vicky Ghionis

CONTENTS

AIM OF THE GUIDEBOOK

The *Guidebook for Accessible Nature Trails – Design Guidelines and Evaluation System* (the "Guidebook") was mainly developed to support the implementation of certain innovative interventions of the BIO2CARE Project for improving and promoting selected recreational and bird-watching ecotrails in the two countries of the Interreg V-A Cooperation Programme Greece-Bulgaria 2014-2020. In this context, it offers specific, legislation-based and practical guidelines to the Beneficiaries of the Project, who will carry out technical works on selected ecotrails under their responsibility, so that it is feasible for as many visitors as possible, including persons with reduced mobility, to enjoy them.

The two countries where these interventions will be carried out, i.e. Bulgaria and Greece, have institutional frameworks in place for accessibility to structured environments (specifications, guidelines, etc.). However, they do not have comprehensive design guidelines for accessible interventions in the natural environment. Consequently, the intention is to make the guidelines and the relevant evaluation system in this Guidebook a useful tool in the hands of the competent authorities.

To this end, the Guidebook consists of two main parts. **Part One** includes **guidelines** aiming to assist in designing the new accessible recreational and bird-watching ecotrails under the BIO2CARE Project, in compliance with the national legislation of the two countries, while also using specifications, guidelines and best practices in place in Europe and internationally. **Part Two** includes a practical **evaluation system** aimed to assist in evaluating accessibility at the interventions carried out under the Project, offering instructions and tools for the inspectors, which allow them to prepare, schedule and carry out suitable inspections, so as to: (i) identify potential negative factors for *visitors with reduced mobility*, (ii) assess how critical these factors are, (iii) propose suitable corrective measures and (iv) develop a *trail accessibility profile* for the purposes of promoting the trail to the general public.

This Guidebook was also developed with the aim of being distributed and used more broadly, meaning not exclusively for recreational and bird-watching ecotrails, but for accessible nature trails in general, beyond the purposes of the BIO2CARE Project.

For this reason, it was also designed as a useful tool for officers of authorities, management agencies, and organisations involved in protecting and showcasing the natural environment of the two countries, so that they may:

- **Comprehend the traits and needs** of persons with reduced mobility (Introduction).
- **Design new nature trails** (Part One) in the area where they operate, so that it is feasible and satisfying for as many persons with reduced mobility people as possible to visit them.
- **Evaluate existing nature trails** (Part Two) in the area where the operate, prepare proposals for improvements, and **develop a *trail accessibility profile***, so that they may offer valuable information to potential visitors.

It is believed that the broad circulation and use of this Guidebook may contribute significantly towards:

- Promoting broadly the right of all citizens, without exclusions, to access and enjoy the natural environment of the two countries and raise awareness among all stakeholders.
- Improving the accessibility and attractiveness of the natural resources of the two countries and developing new activities in nature for *visitors with reduced mobility*.
- Capitalising on the natural wealth of the two countries, with the aim of making the tourism product stand out and attracting new tourism markets that are developing strongly and steadily both globally and domestically, such as tourists with disabilities and elderly tourists.

Wild goal of the species *Rupicapra rupicapra balcanica* with its offspring at Rila National Park, Bulgaria

DISCLAIMER

This Guidebook was prepared based on the relevant technical know-how and expertise already available through forestry departments, environmental agencies and organisations, disability movement bodies and more, on a national, European and international level. Extra effort was also devoted into making the best use of existing accessibility specifications/guidelines in place in both countries, Greece and Bulgaria, despite the various differences between them, so as to ensure compatibility between them and the guidelines in this Guidebook.

Note that this Guidebook does not in any way constitute an institutional text or part of the legislative framework of either country, and does not replace institutional texts or specifications thereof, which clearly supersede this Guidebook. In any case, readers should primarily comply with the official institutional texts. In addition, full compliance with the guidelines and technical requirements included in this Guidebook does not necessarily guarantee accessibility to all potential visitors, but satisfactory accessibility conditions for the largest part of them. Lastly, full compliance with the guidelines in this Guidebook is not always possible in all environments. In some locations, nature itself places prohibitive restrictions when it comes to ensuring full, safe and autonomous access.

KEY TO SYMBOLS USED IN THE GUIDEBOOK

The Guidebook uses the following symbols to assist readers:


Indicates **useful information**


Indicates additional **tips**


Indicates a **warning**


Indicates an **error/mistake**


Notifies inspectors to collect **data** that is useful for informing visitors


Notifies inspectors to collect **photos** (and/or video) from the field


Notifies inspectors to record a web **link** (URL)


Notifies inspectors to perform **measurements** and/or **calculations**


Notifies inspectors to record the exact **geographic location** of the feature being inspected

 Indicates a checkpoint for visitors using **wheelchairs**

 Indicates a checkpoint for visitors with **walking difficulties**

 Indicates a checkpoint for visitors with **visual impairment**

 Indicates a checkpoint for visitors with **hearing impairment**

 Indicates a checkpoint for visitors with **intellectual disability**

✘ Indicates **non-compliance** to the minimum requirements

✓ Indicates **compliance** to the minimum requirements

👍 Indicates **compliance** to proposed specifications *(good practice)*

👍👍 Indicates **compliance** to proposed specifications *(best practice)*

Introduction

DEFINITION AND CLARIFICATION OF TERMS

With a view to making the purpose of this Guidebook clearer and more comprehensible, and to establishing common ground and language, the main terms and concepts that directly or indirectly relate to the object and framework of the Guidebook are listed below.

The term "***mobility***" refers to the ability of a person to walk or move about, as well as their ability to perceive and comprehend the relevant choices offered within an environment.

The term "***visitor with reduced mobility***" refers to any visitor of a nature trail or location whose *mobility* is permanently or temporarily reduced compared to the rest of the visitors, e.g. due to disability, medical condition, inability or any other reason or problem related to body functions or body structure.

In order for as many visitors with reduced mobility as possible to be able to enjoy visiting a nature trail or location, any *obstacles/barriers* must be removed, and provisions for *reasonable accommodation* must be made.

The term "**obstacles/barriers**" refers to anything that **unjustifiably**[1] cancels or limits the *visitor experience* for persons with reduced mobility, when it should be *complete* and on an *equal basis* with the rest of the visitors. Obstacles/barriers arise from *physical/structural constraints* and *discrimination*.

> The term "**physical/structural constraint**" refers to anything that obstructs or limits a visitor with reduced mobility by design (e.g. based on the architectural design), unjustifiably and without any essential reason (e.g. it may simply be lifted by following a different design approach, without any essential collateral damage).
>
> The term "**discrimination**" refers to treating differently people who are in a similar position or treating similarly people who are in a different position (NCDP 2002a: 8-9). This kind of treatment, i.e. discrimination, may be direct or indirect and may be due to beliefs, perceptions, prejudice and attitudes.

The term "**accommodation**" refers to any special provision / adjustment **specifically for cases of visitors with reduced mobility** which permits a visitor experience that is complete and on an equal basis with the rest of the visitors. The accommodation is considered **reasonable** when: (i) it is justified by the type and degree of reduced mobility it is addressed to, and (ii) it does not create a disproportionate burden to the provider, i.e. the cost is not so high as to create a substantial problem.

[1] For example, elements placed for safety reasons are not considered obstacles/barriers for visitors with reduced mobility, as safety justifiably always supersedes accessibility.

The term "**visitor experience**" refers to the entirety of emotions a nature trail or location offers a visitor, through the *affordances*, the *stimuli*, the *information*, the *messages* and the *services* they get from it.

The term "**affordances**" refers to the man-made features of a nature trail or location that are tangible and perceptible by visitors and which allow them to perceive and choose specific available accessibility and use options. These include paths, infrastructure, equipment, mechanisms, etc.

The term "**stimuli**" refers to anything that can stimulate the sensory nerves, activating the visitor's corresponding sense (sight, hearing, smell, etc.). This includes sounds (natural or not, e.g. bird sounds or music), images (natural or not, e.g. landscapes or works of art), lighting (natural or artificial), etc.

The term "**information"** refers to any *fixed* content made available that may be of interest to visitors. This includes content about the location/trail, flora, fauna, history, directional signs, safety signs, etc. Each piece of information is directly linked to its **medium of distribution** (written information, audio information, online information, etc.).

The term "**messages**" refers to any *dynamic* content that is announced, transmitted or forwarded to visitors, with the aim of helping them perceive or carry out specific actions. These include announcements, notices, warnings, etc. Each message is directly linked to its **medium of transmission** (written message, audio message, online message, etc.). *Note: The fundamental difference between messages and information is that messages are generated/transmitted at specific times and are transient/temporary, while information is available right from the start.*

The term "**services**" refers to any provisions or tasks offered to visitors during their visit, aiming to assist them and serve them better. These include conventional/live and e-services, such as accompanying persons, information, tours, transport, food, accommodation, equipment/souvenir purchase, etc.

CREDITS: MUNICIPALITY OF NESTOS

The experience of a visitor with reduced mobility is considered "**complete**" and "**on an equal basis with the rest of the visitors**" when all the options, stimuli, information, messages and services offered to the rest of the visitors are available to visitors with reduced mobility, without any of their critical quality features being unjustifiably compromised, including *perceivability*, *understandability*, *approachability*, *accessibility*, *usability*, *safety* and *autonomy*.

The term "**perceivability**" refers to the ability of visitors to **perceive** something that is addressed to them promptly and effectively.

The term "**understandability**" refers to the ability of visitors to **understand** something that is addressed to them, interpreting successfully what purpose it serves and how they can approach and use it.

The term "**approachability**" refers to the ability of visitors to **approach** something **effectively and without being met with obstacles, barriers or discrimination** linked to their mobility.

The term "**accessibility**" refers to the ability of visitors to **use** something **comprehensively and without being met with obstacles/barriers or discrimination** linked to their mobility.

The term "**usability**" refers to the ability of visitors to **use** something **effectively, effortlessly and to their satisfaction**.

The term "**safety**" refers to the ability of visitors to **use** something **without running a disproportionate risk**.

The term "**autonomy**" refers to the ability of visitors to **use** something by themselves and possibly with their own personal equipment or accompanying person, **without requiring external assistance** (e.g. assistance from other visitors) **and without their dignity being threatened**.

The term "**accessibility profile**" of a trail refers to all the information which describes the elements and features of a trail that affect the experience of visitors with reduced mobility, including valid data, so that potential visitors may determine whether the trail is attractive and suitable for them, and go ahead with planning and scheduling their visit accordingly.

MAIN ACCESSIBILITY FRAMEWORK IN THE PROGRAMME COUNTRIES

The two countries have ratified the **UN Convention on the Rights of Persons with Disabilities**, therefore, undertaking the obligation to fulfil the commitments stemming from it, which include the commitment to ensure accessibility to the natural environment (e.g. see Articles 9, 10 and 30).

***Note**: The text of the Convention is available on the UN website in various languages: https://www.un.org/development/desa/disabilities/convention-on-the-rights-of-persons-with-disabilities.html.*

In addition, they have key institutional texts in place with specifications/guidelines regarding accessibility in general and/or accessibility to the natural environment in particular. The provisions of those texts were taken into account when preparing this Guidebook.

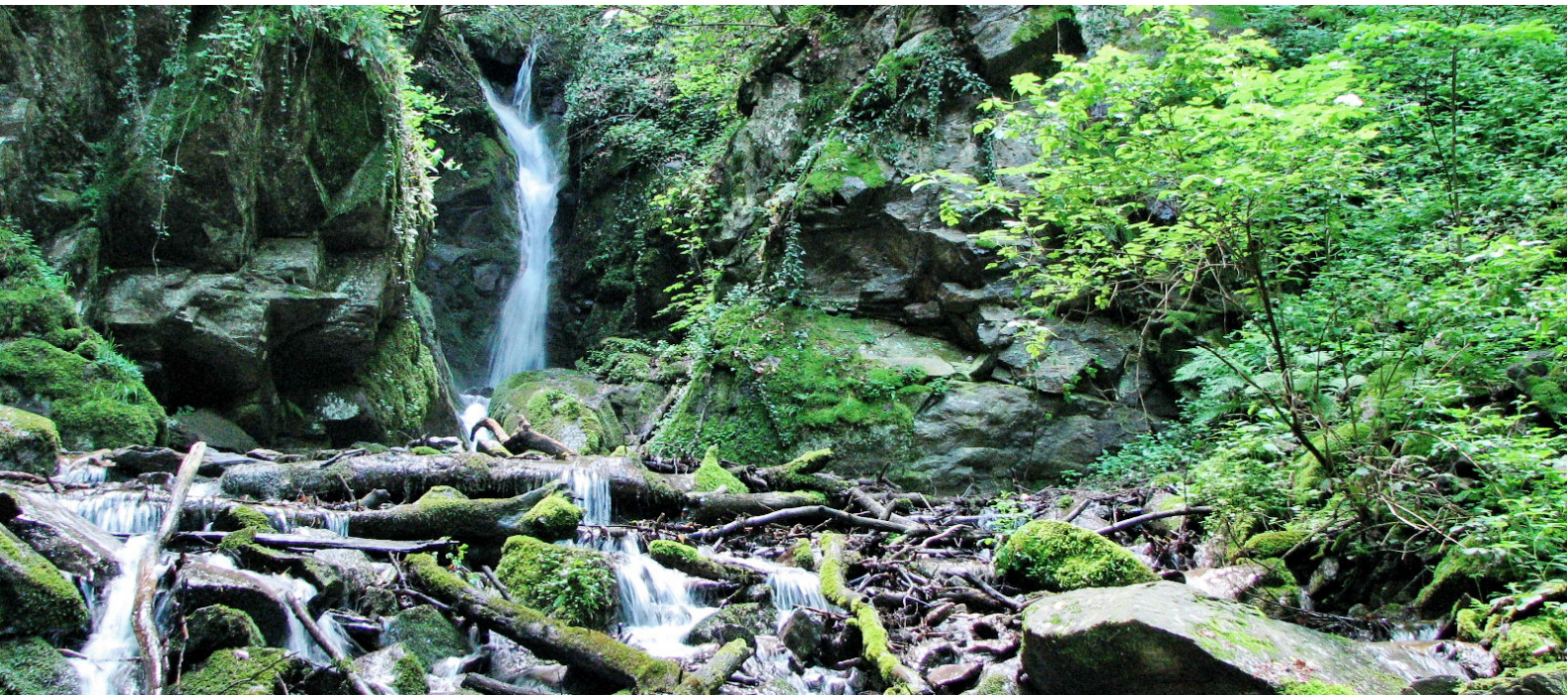
Bulgaria

Regulation No. 4 of 1 July 2009 *on designing, constructing and maintaining buildings in line with the requirements for an accessible environment to the population, including persons with disabilities – НАРЕДБА № 4 от 1 юли 2009 г. за проектиране, изпълнение и поддържане на строежите в съответствие с изискванията за достъпна среда за населението, включително за хората с увреждания (Обн., ДВ, бр. 54 от 2009 г.; доп., бр. 54 от 2011 г.).*

Greece

Ministerial Decision (Greek Ministry of Environment and Energy) No. 151344/165/2017, Government Gazette 206/B/30.01.2017 – *Drafting of technical specifications for mapping, marking, opening and preserving mountain/hiking trails,* as amended and currently in force.

Design Guidelines for Autonomous Movement and Living of Persons with Disabilities, *Designing for All*, issued by the Greek Ministry of Environment and Energy, as instituted in Law 4067/2012, *New Building Regulation*, and currently in force.



OPENING NATURE'S GATES TO ALL

Protected areas are not just a sanctuary and habitat for endangered species. They may also be a special destination for any person; a destination that offers unique moments of coming into contact with nature, doing something recreational and escaping from the fast pace of city living.

As a matter of fact, apart from the beauty and satisfaction visitors get when coming into contact with nature, taking a stroll in nature also benefits mental and physical health. For example, a series of recent studies have shown that a stroll in nature is enough to alleviate depression and reduce high blood pressure.

Therefore, many protected area management agencies around the world, including the areas of the Programme, have recognised the need to open the gates of the areas in their jurisdiction to nature lovers. To this end, they have intensified their efforts to design new trails and infrastructure that are accessible, yet preserving their protective attributes for endemic species and the ecosystem in general.

However, the people who would benefit most from visiting protected areas and coming into contact with nature – i.e. persons with disabilities or chronic conditions, the elderly, etc. – are the ones who tend to find "closed gates" when attempting to visit these trails, since the design of most interventions and infrastructure does not adequately cater for their needs and, in the end, are not prepared to host them.

This mainly happens due to the antiquated approach of designing *one-size-fits-all solutions*, meaning solutions for *typical*[2] users, ignoring or being indifferent to those *deviating*[3] from the norm. However, these people are equally typical and normal, and have the same rights as everyone. Therefore, a change in mentality and approach are required, which will focus on *universal design* and on implementing technical solutions suitable for all, including *visitors with reduced mobility* (see section *Definition and clarification of terms*).

"**Universal Design**" or "**Design for All" (DfA)** *"means the design of products, environments, programmes and services to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design. 'Universal design' shall not exclude assistive devices for particular groups of persons with disabilities where this is needed."*

Article 2 – Definitions, UN Convention on the Rights of Persons with Disabilities

[2] With the statistical definition of the term, i.e. those who do not deviate from the mean.

[3] With the statistical definition of the term, i.e. those that are away from the mean.

ACCESSIBILITY: FREQUENT ERRORS IN PERCEPTION AND STANCE

Accessibility is a significant component of a good experience for visitors with reduced mobility. The main reasons that the designers of the new interventions in nature do not follow the modern *Design for All* practices and continue to apply monolithic designs, ending up with serious accessibility shortfalls, include:

- Mistakenly believing that providing better access to nature for all involves constructions that burden the environment and the ecosystem. Good practices the world over have shown that improving accessibility may very well be in tune with protecting the historical, natural and cultural elements of the environment. Actually, in certain cases, providing easy access – such as elevated tracks – may even contribute to better protecting fragile ecosystems.
- Falsely estimating that accessibility is a matter of imposing technical standards which involve high costs (Report by the Expert Group set up by the European Commission 2003:8-10), despite many surveys documenting that the cost for achieving accessibility is exaggerated.
- Erroneously believing that accessibility is an additional design component which may be added later on, ignoring the fact that a large part of the obstacles may not be lifted afterwards and usually require redesign/construction.
- Ignoring the added value and financial benefits of *Design for All*, and ignoring the significant drop in costs it offers compared to providing accessibility afterwards.
- Mistakenly believing that accessibility involves charity and is a matter of voluntary design, ignoring basic human rights and the existing frameworks/regulations in place.
- Mistakenly believing that accessibility is exclusively about facilitating persons with disabilities, ignoring the significant benefits for other population groups.
- Having the misguided belief that persons with disabilities are mainly persons using wheelchairs and the blind, ignoring other categories of disabilities, chronic conditions, disorders and diversities.
- Ignoring and not fully understanding the traits and needs of *visitors with reduced mobility*, such as persons with disabilities.
- Having inadequate training in the principles and techniques of *Design for All* and *participatory design* in collaboration with persons with disabilities and other target groups.
- Lacking special guidelines, accumulated knowledge and experience from good practices which effectively combine ecoprotection, sustainability, safety and accessibility.

This Guidebook aims to assist in eradicating all of these to the extent possible.

TRAITS AND NEEDS OF VISITORS WITH REDUCED MOBILITY

As mentioned in section *Definition and clarification of terms*, *visitors with reduced mobility* of a nature trail make up a significant part of the population, who may not be given the chance, completely or partially, to enjoy a pleasant visitor experience.

During the life cycle of a visit to nature, such visitors may come across obstacles/barriers in various stages, i.e. upon approaching and entering the area, when moving from one point to the next along the trail, when trying to use the facilities, services and available equipment, etc.

A series of various population groups are among these people, all of whom have a common trait: compared to the rest of the visitors, they **have temporary or permanent difficulties and limited or different abilities to perceive, hear, see, communicate, adjust, move and function in general**. As a result, any obstacles/barriers, as well as the absence of reasonable accommodation – elements that the rest of the visitors may not even notice – either force them to cancel or interrupt their visit, or become an inconvenience and exhaustive.

Categories of visitors with reduced mobility

The main population groups that view obstacles/barriers and reasonable accommodations as a crucial factor that greatly affects the quality of a visitor experience on a nature trail are:

- Persons with disabilities, who include persons with disorders, chronic conditions and rare conditions.
- Old and very old people.
- Pregnant women.
- Persons with abnormal body proportions.
- Persons with allergies.
- Persons with situational or transient loss or reduction in functions.

Although the following categories are generally included in one of the above categories, they need to be mentioned separately so that special attention is paid both to the traits and the needs of any accompanying external factors they may depend on:

- Persons with accompanying persons, including children accompanied by a parent.
- Persons who use or operate any type of wheelchair.
- Persons with trained assistance dogs or guide dogs.
- Persons who use any type of aids (mobility, vision, hearing, communication aids, etc.).

The list above is indicative and not exhaustive. However, research into the traits and needs of these groups reveals that persons with disabilities constitute the category that:

a. has the most needs and the most specialised ones compared to the rest of the categories,
b. demonstrates needs that are the least known and understood by designers,
c. presents many needs, if not all, we also encounter in the rest of the categories.

For these reasons, the next section focuses on a more detailed presentation of the traits of persons with some type of disability and the needs/requirements stemming from each type.

Disability and persons with disability

"**Disability** is characterized as the outcome or result of a complex relationship between an individual's health condition and personal factors, and of the external factors that represent the circumstances in which the individual lives (World Health Organization, 2001:18). Therefore, a person may experience disability in an environment to a lesser extent or even not at all compared to another person (NCDP, 2005), depending on the degree to which the environment presents features that work as insurmountable or overwhelming obstacles.

The term **person with disability** refers to any person with physical, and/or sensory, and/or intellectual, and/or mental disorder, and/or chronic condition (thalassaemia, kidney disease, etc.). Recommendation Rec(2006)5 of the Committee of Ministers to the member states[4] mentions that the estimated proportion of persons with disabilities in the total population in Europe is 10-15%, that the main causes of disability are disease, accidents and disabling conditions among the elderly, and that the number of disabled people is expected to grow steadily due to increasing life expectancy.

The term "person with disability" is the widely accepted term by the persons themselves and their families, as opposed to a series of antiquated and less acceptable terms we encounter even in official state documents and modern language dictionaries, such as "handicapped", "person with special needs", "invalid", "incapacitated", "crippled", "person with special skills", etc.

Persons with disabilities are not a homogeneous group nor do they all have the same needs. There are many types of disabilities, obvious or hidden, severe or mild, permanent or temporary, one or a combination thereof (Christofi, M., 2013:127). This translates into different skills and needs, which are actually also affected by other factors, such as gender, age, socio-economic status, etc.

Persons with disabilities are usually grouped as follows:

- Persons with physical disability (motor impairments).
- Persons with sensory disability (visual and/or hearing impairments).
- Persons with intellectual disability and learning/communication difficulties.
- Persons with mental illness.

[4] See Recommendation Rec(2006)5 of the Committee of Ministers to member states on the Council of Europe Action Plan to promote the rights and full participation of people with disabilities in society: improving the quality of life of people with disabilities in Europe 2006-2015, as adopted by the Committee of Ministers on 5 April 2006 at the 961st meeting of the Ministers' Deputies. Available on: https://www.refworld.org/docid/4a54bc3f1a.html.

However, other population groups also have needs similar to those of persons with disabilities: "*Persons with disabilities include those who have long-term physical, cognitive, intellectual or sensory impairments. Others who may be included in this group due to problems in accessing tourism products and services are people with temporary disabilities, people with crutches*[5] *during a temporary period, the elderly, people carrying luggage, small children or people who are big or small in size or stature*" (UNWTO, 2013:4).

All these groups have to confront various obstacles daily that the environment puts up in various settings (Christofi, M., 2013:127). The term *obstacle/barrier* (see section *Definition and clarification of terms*) includes anything man-made that deprives a person with disability the ability to fully participate in any social activity and includes:

- **Architectural obstacles** due to infrastructure design (shape, dimensions, etc.), quality of materials, emergency evacuation shortfalls, etc.
- **Physical obstacles** (man-made) due to objects integrated in the environment (doors, windows, lifts, furniture and equipment, signs, trees and plants, etc.). These may be placed in a manner that obstructs access to and/or movement on these by persons with disabilities, either because of prohibitive dimensions or because they are not easily noticed.
- **Communication obstacles** that affect the ability of persons with disabilities to receive information or to communicate via the means and systems available (live, printed media, phones, internet, signage, etc.).
- **Technological obstacles** associated with the use of equipment and aids, such as computers and peripherals (keyboard, software, etc.), phones, machines, etc.
- **Behavioural obstacles**, meaning discrimination due to misguided beliefs as to the abilities of a person with disabilities, mainly stemming from people who are not aware of the disability and/or how to communicate with persons with disabilities.
- **Obstacles with policies/procedures**, meaning discrimination arising from the regulations, protocols, practices and policies in force that exclude persons with disabilities from participating in activities (recreational educational, etc.).

Every disability relates to specific obstacles/ barriers and special adjustments, as outlined in the following sub-sections.

[5] Meaning walking aids (forearm crutches, underarm crutches, walkers, etc.).

Persons with physical disability

Persons with physical disability, meaning persons with motor and movement impairments (of themselves and/or the objects and controls in the environment), including persons who use wheelchairs, need:

- information on the available choices, at trailheads and key areas,
- trails and structural elements of suitable dimensions, which may be larger or smaller depending on whether they need an accompanying person or some sort of aid,
- movement surfaces free from any obstacles, non-slip, smooth, without joints, continuous and stable, with smooth, small, cross or longitudinal slopes,
- areas for manoeuvring, turning, resting and stopping (including space for any accompanying persons), with adequate dimensions and at regular intervals, especially along tiring parts of the trail,
- suitable provisions for overcoming height differences (ramps, lifts, platform lifts, etc.) and for unobstructedly approaching equipment, machines, etc.
- equipment and machine controls (water fountains, periscopes/telescopes, bins, etc.) suitably adjusted, which do not require considerable strength or skills, or extremely fast reaction times on the part of the user, and placed at a suitable height and position, allowing access to them,
- appropriate safety provisions, such as handrails, guard rails, etc.,
- suitable infrastructure for disabled parking spaces, pick-up and drop-off points, and car access wherever specified.

By addressing these needs for nature trails, persons with physical disability could move autonomously, provided that:

- there are no steps or man-made obstacles along the paths and throughout the trail,
- the surface of the trail is appropriate (level, stable, continuous, smooth, without steps, etc.),
- the cross or longitudinal slopes are acceptable,
- the width of the trail is suitable, with acceptable minimum width,
- there are suitable guard rails and other safety and evacuation measures in place,
- there are suitable areas available for stopping, resting and manoeuvring,
- the visitor facilities (restrooms, kiosks, snack bars) are approachable and accessible,
- information is provided at accessible points,
- there is information available on the trail features (with a date of issue / last update of the information), such as: length, average duration, difficulty level, maximum/average slope, maximum/average width, surface features, potential risks during adverse weather conditions, possibility of being attacked by wild animals, tips for emergencies, etc.,
- any objects the person may be required to handle, such as equipment (locks, handles, doors, ticket machines, vending machines, bins, etc.) and signage items, are located at the right height and position, and are easy to handle.

The following categories often have similar needs to this group: old and very old people, persons with abnormal body proportions, persons with cardiopulmonary problems, kidney patients, injured persons, persons who have had surgery recently, pregnant women, etc.

For their own personal safety and autonomy, these people may use wheelchairs, accompanying persons, trained assistance dogs, crutches and canes, and/or other aids. Suitable conditions must also be ensured for these cases.

Persons with visual impairment

Persons with visual impairment, partial or total vision loss and vision disorders (colour blindness, glaucoma, etc.) need:

- information on the available choices, at trailheads and key areas, in the right format,
- guidance in complex environments by means of guides for blind (on the ground or parallel to the ground, such as tactile walking surface indicators and handrails),
- safe trails, distinct and clearly marked, free from obstacles that cannot be directly perceived (either by the person or by the guide dog), smooth and non-slip, well lit and without sharp changes in lighting and reflections (to assist partially sighted persons), with continuous and stable movement surfaces, and with acceptable cross and longitudinal slopes,
- precautions and signage for hanging elements, protrusions, steps, changes in elevation and directions, start and end of trail, etc.,
- elements, equipment and mechanisms with different textures and sharp colour contrast, safe to the touch, with audio instructions and connected to any tactile indicators,
- appropriate signage (audio, and/or tactile, with sharp colour contrast, large typeface, etc.).

By addressing these needs for nature trails, persons with visual impairment could move autonomously, provided that:

- any information or message provided is comprehensible, precise and clear; if written, it should be in discernible fonts and sharp colour/typeface contrast, and also available in alternative formats, such as in audio and tactile format (e.g. Braille, vibration, etc.), and in a format suitable for people with amblyopia,
- there is information available on the trail features (with a date of issue / last update of the information), such as length, average duration, difficulty level, maximum/minimum slope, existence of tactile walking surface indicators, movement surface features, potential risks during adverse weather conditions, possibility of being attacked by wild animals, tips for emergencies, etc.,
- any pictograms are accompanied by discernible text and text in accessible formats,
- the trail surface and/or colour differ from the surrounding space and has the right tactile indications to help with their orientation,
- the trail is wide enough to accommodate one person with visual impairment and an accompanying person or a guide dog,

- there are no ambiguities as to the direction, mainly right after a major change in the lighting levels (e.g. right after entering or exiting a densely wooded area),
- there are no unexpected obstacles (on the left, on the right, above or on the surface, etc.),
- entry of visitors with guide dogs is permitted in all public places.

Old and very old people often have similar needs to this group.

For their own personal safety and autonomy, these people may use white canes, accompanying persons or specially trained guide dogs. Suitable conditions must also be ensured for these cases.

Persons with hearing impairment

Persons with hearing impairment, such as the deaf and hard of hearing, need:

- well-lit, clearly marked areas and trails,
- visual and easy-to-understand signage and information/tips, which use easy-to-understand pictograms, accompanied by simple and clear text,
- good area acoustics, systems and aids/options to increase the sound volume,
- alternative methods for communication, information and notifications, such as with lip readers or sign language interpreters, use of subtitles, text messages, written or illuminated signs,
- mechanisms and equipment compatible with special aids.

By addressing these needs for nature trails, persons with hearing impairment could move autonomously, provided that:

- any audio information or messages are also available in visual form, using sign language interpreters, subtitles, clear and comprehensible text, etc.,
- the lighting is suitable, allowing lip reading and control of the space,
- there is information available on the trail features, such as possibility of being attacked by wild animals, tips for emergencies, etc.

Old and very old people often have similar needs to this group.

For many people in this category, sign language is their mother tongue, and they have little or no knowledge of the spoken/written language. Written information may be hard for them, and written communication inconveniences them in general. It is recommended that any messages are also available in the form of pictures, symbols, etc., while extensive information should be available in video with sign language.

For their own personal safety and autonomy, these people may use specially trained assistance dogs and/or other aids. Suitable conditions must also be ensured for these cases.

Persons with intellectual disability

Persons with intellectual disability – including persons with learning disabilities, autism, Down syndrome, Alzheimer's, schizophrenia, bipolar disorder – need:

- information on the available choices, at trailheads and key areas, in the right form,
- simple area layout with open exits, so that they do not cause claustrophobia, and safe, clearly marked trails without hidden surprises,
- continuous, simple and easy-to-understand signage, indications with colour contrasts and images,
- standard, easy-to-use equipment with user-friendly mechanisms and applications, and simplified instructions for use wherever necessary.

By addressing the needs for nature trails, persons with intellectual disability could move autonomously, provided that:

- the trails are clearly marked, safe and without hidden surprises that could cause confusion and panic,
- any information or message provided is comprehensible, precise and clear; if written, it should be in clear fonts, etc., and also available in alternative formats, such as in audio and in easy-to-read format,
- symbols and pictograms are used, always accompanied by text, given that their use may help some people, but they are not often recognised by people with visual impairment or learning difficulties, or people from different cultural backgrounds,
- there is information available on the trail features (with date), such as information for people with fear of heights or claustrophobia, information on the possibility of being attacked by wild animals, tips for emergencies, etc.,
- entry of visitors with assistance dogs is permitted in all public places.

The following categories often have similar needs to this group: persons with transient impaired perception, old and very old people, toddlers and children, pregnant women, absent-minded, tired or dizzy people, etc.

These people may have slower processing speed, may have limited contact with the environment and surrounding objects, and may be unable to orient themselves, react autonomously, or even react to obstacles or danger.

To be able to move autonomously, these people may need to use accompanying persons or specially trained assistance dogs. Suitable conditions must also be ensured for these cases.

Old and very old people

The age of 65 is considered the biological limit of ageing. After that age, the rate of health problems increases significantly, while after 85, most people have more pronounced sensory and locomotor problems. Old age brings about physical, mental and social changes to the life of a person and impacts the abilities and skills associated with the senses (sight, hearing, touch, etc.), movement, and especially with precision and resilience in movements, memory, learning and other cognitive functions.

In particular, older people often face difficulties with functions, such as:

- thinking and acting quickly,
- understanding and decoding complex conversations, modern lingo and symbols,
- speaking a second language other than their mother tongue,
- understanding and interacting with modern technology,
- carrying out two actions at once,
- collecting the information they need when they need it,
- remaining focused for long periods of time.

By addressing these needs for nature trails, old and very old people could move autonomously, provided that:

- the trails carry the features mentioned above in the various categories of visitors with disabilities, and there are fast-track trails available,
- there is information available on health and emergency services within the area and/or close by,
- any information or message is available in simple language, without modern terminology, expressions and symbols that may escape them and for which the necessary explanations are not provided,
- any mechanisms of applications are simple and clear, accompanied by simple and clear instructions for use wherever necessary.

Compared to younger generations, elderly visitors are more attracted to tourist information and activities that stimulate the senses and to coming into contact with the locals. It is worth investing in information (e.g. local feasts and festivals) and services targeted to them.

Note that the elderly often visit areas in large groups, so there must be suitable and clear signage before the trailhead about spots where overcrowding could be dangerous.

For their own personal safety and for companionship, these people may be accompanied by untrained dogs and may use aids. Suitable conditions must also be ensured for these cases.

Other remarks/notes

Persons with allergies also encounter difficulties due to architectural obstacles, e.g. in areas that are not well ventilated, in overcrowded areas, in enclosed areas where animals are allowed to enter, etc.

Persons with chronic conditions and rare disabilities are often quite prone to infections and bacteria, a fact that requires stringent cleanliness and hygiene practices in public places and, subsequently, corresponding procedures/policies.

The **escape** and **emergency and evacuation plans** must be kept up-to-date, with suitable provisions for all types of visitors with reduced mobility.

It is important for all visitors to have **water for human consumption** (potable water) available, either in its natural state or processed, and corresponding provisions should be made wherever possible, without omitting the relevant signage and information on the organoleptic and microbiological quality of the water and the date of the most recent inspection, and ensuring compliance with the relevant parametric values of the legislation in force.

Another very important factor for the accessibility, proper service and participation of all categories of visitors with reduced mobility is the **attitude** and **education/training of staff** (reception staff, guards, guides, etc.) on issues that relate to accessibility, the needs of persons with various types of disability and the proper ways to communicate with and behave towards these people.

It is best to have a **first-aid kit** and **first-aid equipment** available, which must include medications and provisions for persons with disabilities, persons with chronic conditions, the elderly, pregnant women, people with allergies, etc. (e.g. insulin injections, bronchodilators for asthma, cortisone pills and/or injections, tongue depressors, etc.).

It is also best to ensure visitors have access to a **hotline**, which will operate during visiting hours and people will be able to communicate in their native language, but also in English.

Conclusions and main principles of Design for All

The aim of ensuring accessibility is to eradicate the obstacles/barriers and to create the right provisions, without an environmental burden and encompassing the largest segment of reduced mobility, in a manner that all visitors will be able to enjoy an unforgettable experience, autonomously, safely and with their dignity intact.

Although each visitor may have different needs, note that ***universal*** solutions must always be sought. This means that during design, meeting the needs of one category of visitors should not rule out meeting the needs of the rest of the visitors. When faced with a series of alternatives, the best solution is always the one that excludes the fewest people. The best way to find universal solutions is to comply with the principles of *Design for All*, which include:

1. Equitable use (equal for all).
2. Flexibility in use (adjustments).
3. Simple and intuitive use.
4. Perceptible information and control/handling elements.
5. Tolerance for error.
6. Low physical effort on the part of the user.
7. Size and space for approach and use.

When the principles of *Design for All* are carried out skilfully, the design solution may very well also be environmentally friendly.

Also note that the issue of accessibility should be addressed ***horizontally*** and must be consistently applied not just on the infrastructure (paths, parking spaces, information kiosks, viewing areas, eating spots, rest areas, etc.), but also on the equipment, information and services, and even procedures (e.g. emergency procedures).

4+1 MAIN PRINCIPLES FOR FRIENDLY NATURE TRAILS FOR ALL

1 The visitor choices are obvious and communicated effectively with accessibility information for all.

2 There is no discrimination due to:
- attitudes/behaviours
- policies/procedures

3 The infrastructure and equipment, information and messages, and services and procedures do not raise unjustifiable obstacles/barriers that affect perceivability, understandability, approachability, accessibility, usability, safety, autonomy or one's dignity during use.

4 There are suitable adjustments in place for reasonable existing:
- architectural obstacles
- natural obstacles
- obstacles in information and communication
- technological obstacles

+1 Persons who have no physical access to stimuli still experience them with the right support.

Part One:
Design guidelines for accessible nature trails

A. KEY DATA ABOUT USERS

In *Design for All* the key is understanding the **range of dimensions** and the **functions** of users (for example):

- the range of the users' dimensions that are associated with the space,
- the range of the users' physical strength and stamina,
- the range of the users' movements and movement speed,
- the range of the users' visual acuity and visual field,
- the range of the users' perceptive and processing ability,
- the range of the users' ability to communicate,
- etc.

By analysing these – as well as by examining each user overall as a unit, along with any personal equipment / accompanying person, and studying the various anthropometric data and not – it is possible to determine the following.

- The necessary dimensions and features of the surfaces and the area so that a visitor can conveniently, safely and autonomously[6]:
    - stand,
    - move towards a direction,
    - change directions (on the spot or on the move),
    - stop (i.e. put the brakes on),
    - reach something and apply pressure on it,
    - perceive something,
    - see something and see over/between something,
    - climb on / get off something.
- The dimensions and features of the controls, equipment, mechanisms and systems that require contact and/or strength.
- The dimensions and features of the support elements, safety elements, etc.
- The dimensions and features of the surfaces with visual information, so that visitors can read the text and recognise the images.
- The type and features of the stimuli required for activating specific user senses and communicating with them, including the permissible speed of information transmission and system reaction.
- The necessary features of the information and messages, so that users can understand them and memorise them if necessary.

[6] **Note**: Each user along with any possible personal equipment or accompanying person is considered an autonomous unit.

At this point, note that with regard to the features and dimensions of various man-made environmental elements and not, it has been observed that the most typical requirements relate to users of various types of wheelchairs, including those with accompanying persons. This means that if an environment has the right features for this category, then it is suitable and acceptable for the majority of the other visitor categories. Especially with regard to the dimensioning guidelines, both in structured and in natural environments, persons using wheelchairs are used as the yardstick, given that the dimensions of the wheelchair and its multiple contact points with the ground (two large and two small wheels for standard manual wheelchairs) are the most demanding case.

A1 Data about users of wheeled mobility aids

Wheeled mobility aids are mainly separated into the following categories:

- manual wheelchairs,
- motorised wheelchairs,
- mobility scooters.

A1.1 Dimensions of the surface area occupied by wheelchair users

A1.1a Manual wheelchair users

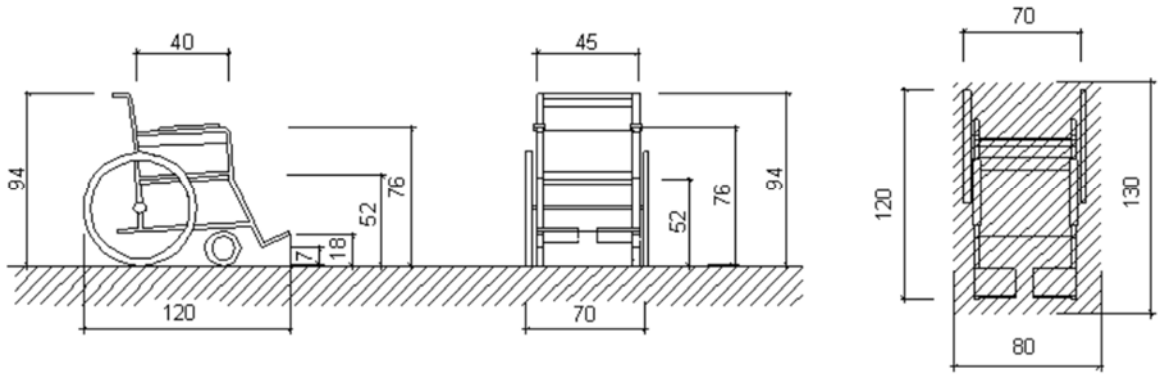


Figure 1. Dimensions of manual wheelchair in cm (side view on the left, rear view in the middle and top view on the right)
Source: Ministry of Regional Development and Public Works – Bulgaria (2009)

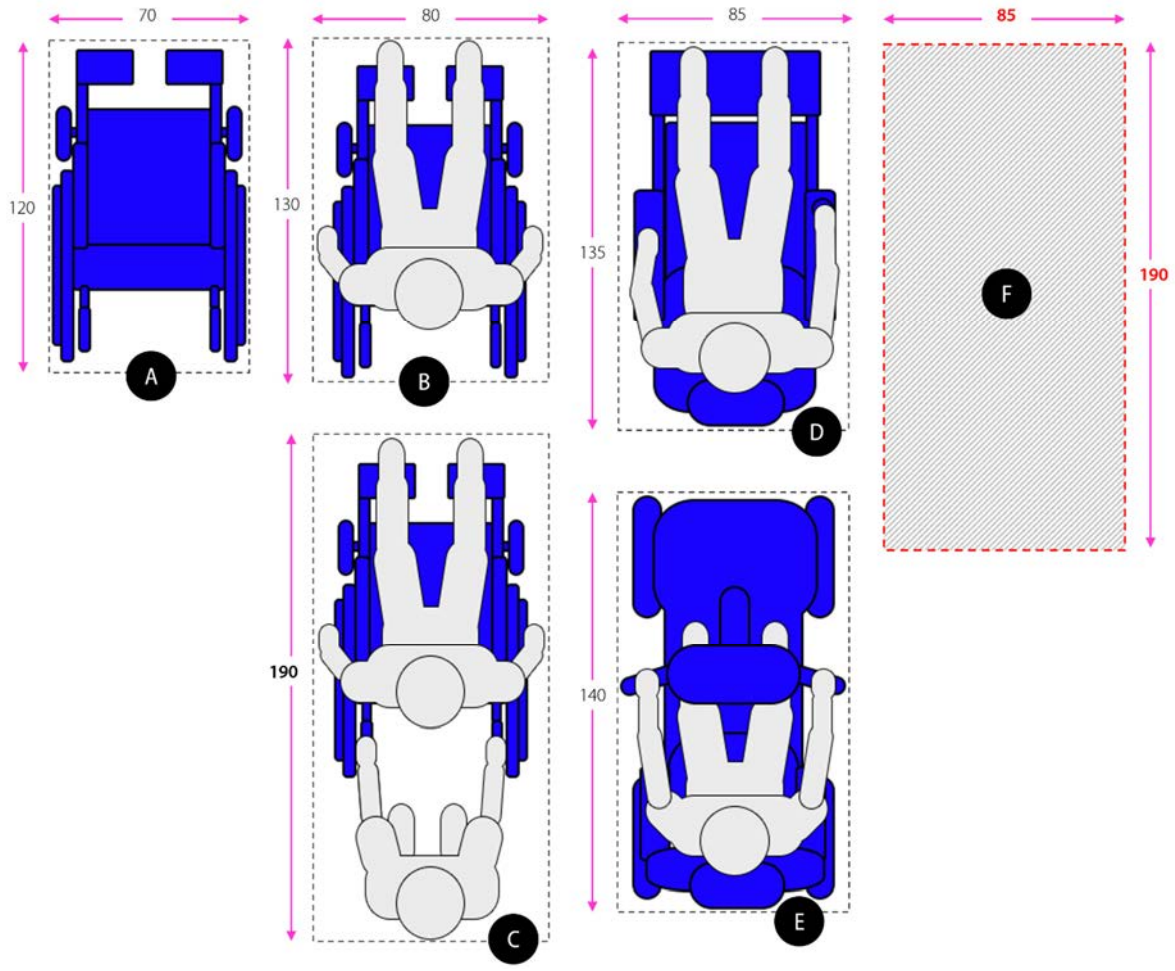
Note that these dimensions are not universal, but an indication, while measurements from other sources indicate deviations, as diverse as +/-10%.

Note that during the design, it is recommended that an additional 5 cm are added on both sides to the width of the wheelchair (70 cm), reaching a width of 80 cm in total, which is necessary for turning the wheels by hand.

Note that during the design, it is recommended that an additional 60 cm are added to the length of the wheelchair (130 cm) on the back, reaching a length of 190 cm in total, which is necessary in the event that the wheelchair is pushed by an accompanying person.

A1.1b Users of various types of wheelchairs

Based on the previous notes, the following figure illustrates the dimensions of the surface area occupied by users of various types of wheelchairs.



(A) = Manual wheelchair
(B) = Manual wheelchair user
(C) = Manual wheelchair user with accompanying person
(D) = Motorised wheelchair user
(E) = Mobility scooter user
(F) = Minimum area for all dimensions

Figure 2. Dimensions of the surface area occupied by users of various types of wheelchairs (in cm)

An area (e.g. in very narrow yet short paths or in short stop points, etc.) **90 cm wide** and **200 cm long** is sufficient for a very large percentage of users.

A1.2 Surface dimensions for wheelchair users to turn/twist (on the spot)

A1.1a Manual wheelchair users

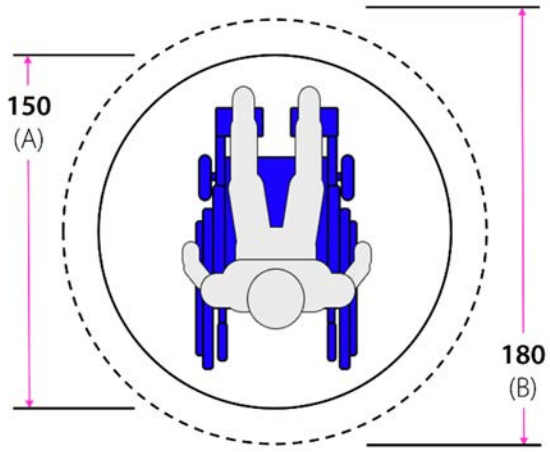
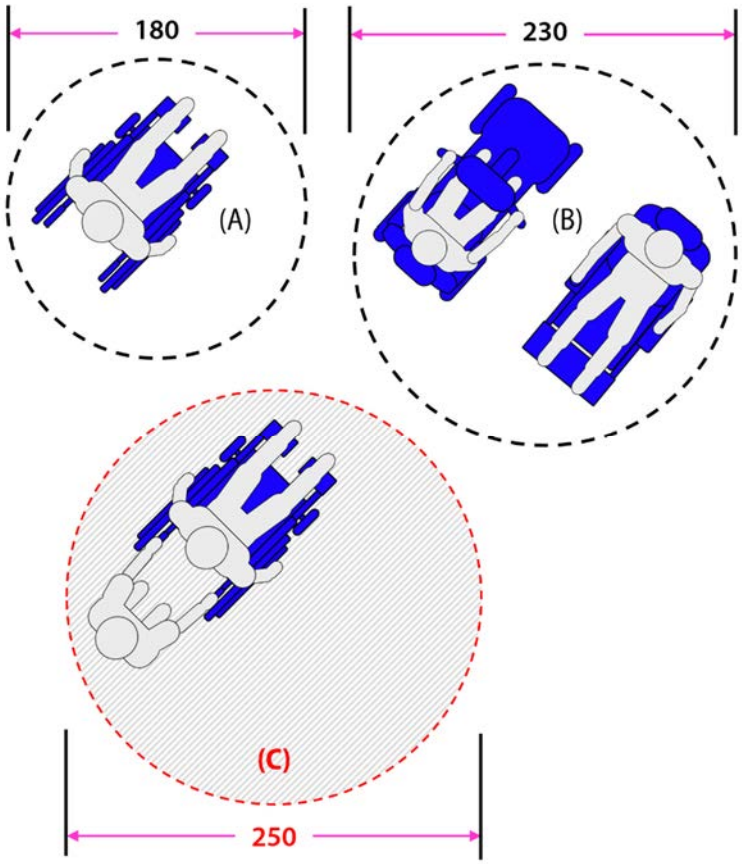


Figure 3. Required dimensions for turning a manual wheelchair (in cm)
Reproduced from: United Nations, SOLIDERE, ESCWA (2004)

A1.2b Users of various types of wheelchairs



(A) = Minimum surface area for manual wheelchair users

(B) = Minimum surface area for motorised wheelchair or mobility scooter users

(C) = Minimum surface area for all dimensions (including manual wheelchair user with accompanying person)

Figure 4. Required dimensions for turning for users of various types of wheeled mobility aids (in cm)
Source: IDEA Center Anthropometry of Wheeled Mobility Device (http://www.udeworld.com/anthropometrics.html)

An area with a **diameter of 250 cm** is sufficient for a very large percentage of users.

A1.3 Dimensions of required surface area of path (in a straight line) for wheelchair users

A1.3a Manual wheelchair users

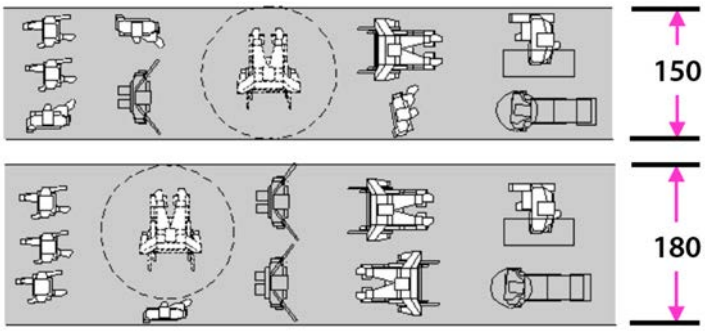


Figure 5. Required dimensions for paths for manual wheelchairs (in cm)
Source: Ministry of Regional Development and Public Works – Bulgaria (2009)

With regard to these dimensions of required surface area of path (in a straight line) for wheelchair users, note that there should be ample space along the trail for (i) the user to turn, (ii) for other users travelling in the opposite direction.

A1.3b Users of various types of wheelchairs

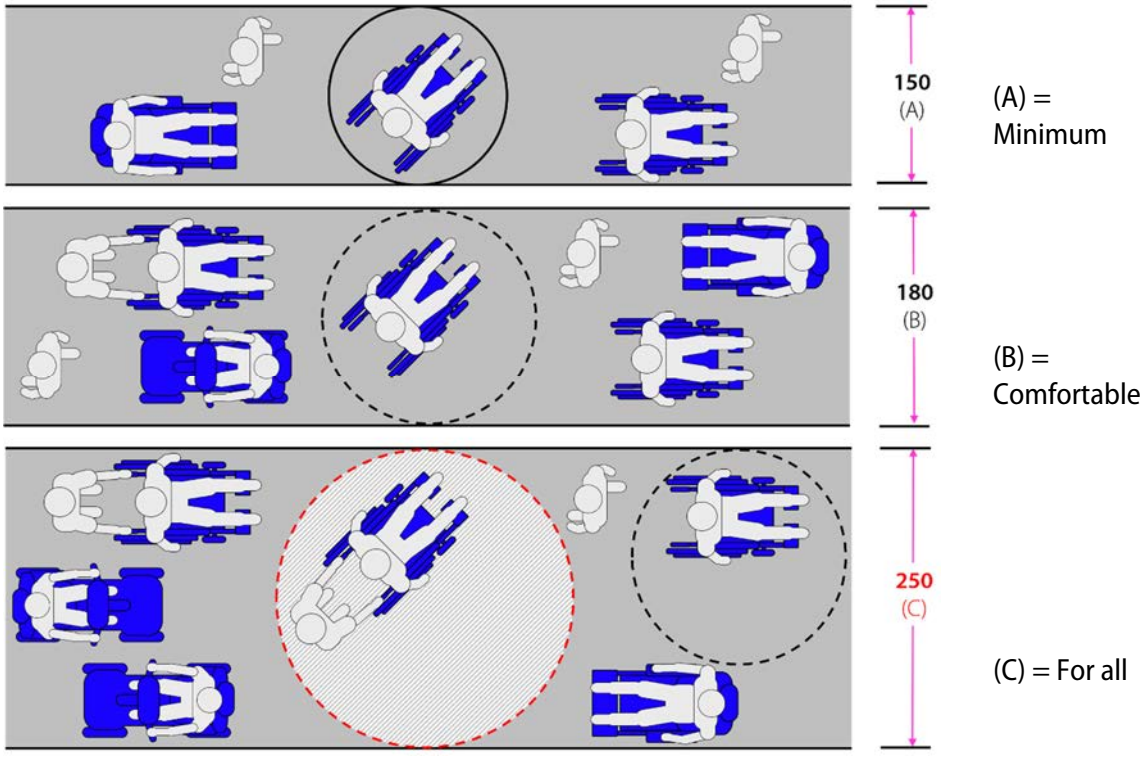


Figure 6. Required dimensions for paths for various types of wheeled mobility aids (in cm)

A trail with a minimum **free width of 250 cm** is suitable for a very large percentage of users, for cases of parallel use and for changing direction while on the move.

A1.4 Approachability options – zones for installation of elements

A1.4a Vertical approachability option

Figure 7. Vertical approachability option (in m)
Source: Ministry of Environment and Energy – Greece (1997)

A1.4b Zones for vertical installation of control mechanisms

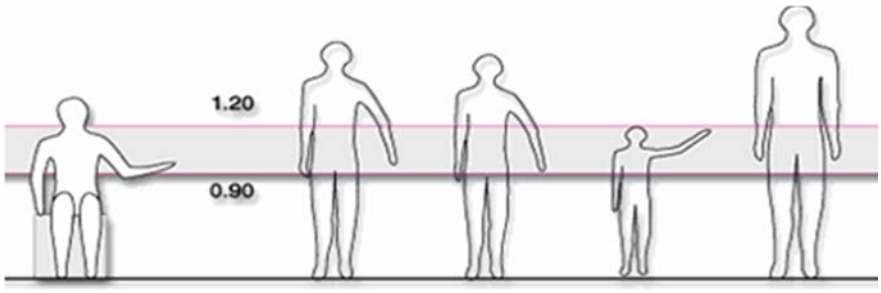


Figure 8. Zones for vertical installation of control mechanisms (in m)
Source: Ministry of Environment and Energy – Greece (1997)

A1.4c Zones for vertical installation of handrails and handles

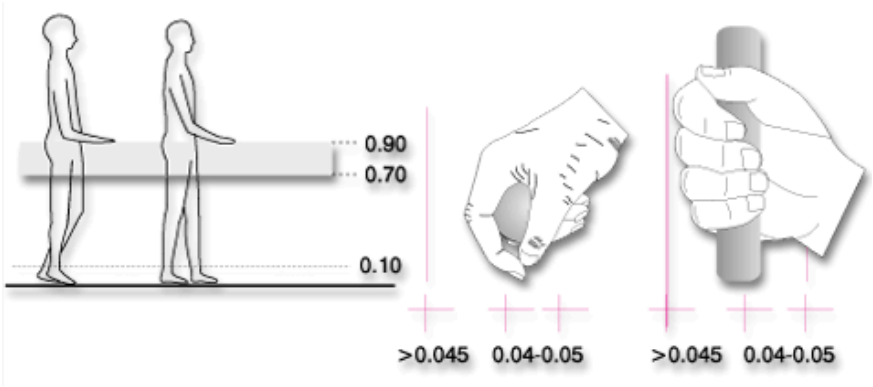


Figure 9. Zones for vertical installation of handrails and handles (in m)
Source: Ministry of Environment and Energy – Greece (1997)

The proper height for installing handrails for wheelchair users is **70 cm**, while for standing users it is **90 cm**, so it is customary to place two handrails, one at each height.

The handrails and handles must: (i) be round or have rounded edges, (ii) have at least **4.5 cm of free space** around them so the wrist can fit, and (iii) must be **between 4 cm and 5 cm in diameter**.

A2 Data about persons with visual impairment and blind persons

Persons with visual impairment are often not in a position to detect with their eyes obstacles and dangers along their course (either natural or man-made). As a matter of fact, when a person with visual impairment comes across an obstacle or problem, even if they are not injured and are able to continue, they may need:

- to recover from the unexpected shock,
- to seek ways to overcome the obstacle (e.g. get off track), a fact that may lead to another perilous situation,
- to locate where the path continues,
- to reorient themselves,
- to continue on their course with grave concerns of further obstacles along the way.

Therefore, it is of vital importance for one to be aware of the traits of users in this category, by designing and evaluating the trails accordingly so as to mitigate the risk of accident or injury to the extent possible, as well as limit any consequences.

The needs are more demanding in the following key categories:

- persons who use white canes,
- persons who use trained guide dogs,
- persons with various types and degrees of limited eyesight.

A2.1 Detection zones for users with white canes

A large part of persons with visual impairment and blind persons use white canes (i) to follow a marked trail and tactile walking surface indicators and (ii) to detect unexpected obstacles.

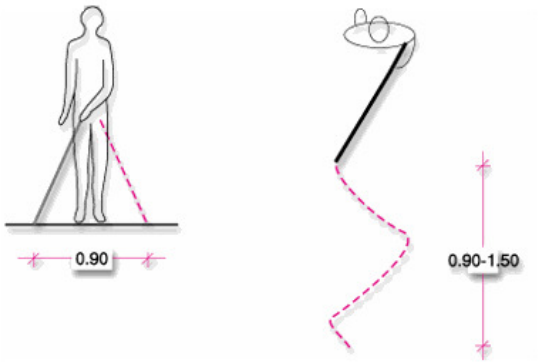


Figure 10. Detection zone for white canes (in m)
Source: Ministry of Environment and Energy – Greece (1997)

As depicted in the figure, persons who use white canes may detect obstacles in front of them (at ground level) within a **90 cm wide zone**, a width that does not differ from the minimum width for narrow yet short paths or short stop points for users of various types of wheeled mobility aids, which confirms the point raised in section *A1.1b Users of various types of wheelchairs*.

Note that depending on the walking pace of the person with a white cane, a distance between **90 cm and 150 cm** is required to conclude the detection from one side to the other and back again, a fact which means that course changes (e.g. turns) require a minimum length of **150 cm** (just as the case of persons using wheelchairs).

Obstacles starting at waist height cannot be detected by people using white canes. To ensure the safe movement of persons using white canes, special attention must be paid to protect these persons from protruding or hanging objects. To this end, a **clear height of at least 2.30 m** (*Ministry of Regional Development and Public Works – Bulgaria, 2009:11*) from the ground, free from hanging and/or protruding obstacles, must be ensured throughout the width and length of the trail.

Any protruding/hanging obstacles that cannot be removed and are located at a height less than 2.30 m (e.g. tree branches), **must be projected on the ground**, with constructions that cover the entire width of the trail where these items protrude and at least the entire length of the obstacle, which can be detected with a white cane (the recommended height for detectable constructions should be at least **68 cm** from the ground).

Note that in no event should the protruding/hanging obstacles reduce the required clear width of the path or trail.

A2.2 Traits of users with guide dogs

Guide dogs have been specially trained to safely guide a person, avoiding obstacles. In addition, many guide dogs are also trained in intelligent disobedience: if they are given an unsafe cue from their handler, they are taught to disobey it (for example: refusing to step out into the street when there is oncoming traffic). Guide dogs are also trained to have impeccable manners (e.g. in public places and places of public accommodation, such as restaurants, public transport, etc.), have limited hunting instincts and are capable of avoiding distractions (such as other animals).

Guide dogs are recognised from their distinctive vest harness and handling leash. Their handlers must carry with them at all times the dog's certification and health booklet.

Guide dogs walk and stand alongside and just in front of the person, so the minimum required width for narrow paths and stops does not differ much from that required for users of various types of wheeled mobility aids, which confirms the point raised in section *A1.1b Users of various types of wheelchairs*.

After proper training (of both parts), guide dogs can (i) lead the user within a clearly marked path, (ii) stop as a warning when reaching a change in elevation, such as steps and sharp changes in slope, and (iii) avoid and/or stop as a warning when reaching dangerous obstacles (e.g. tree branches).

Note that a guide dog may veer from the paths to avoid a danger or obstacle.

⚠ Also note that guide dogs, especially in unfamiliar environments, are fully guided by their handler and it is up to the handler to know where they are at any point, to determine the route they will follow and to know if and when the route is safe.

⚠ In addition, note that not all guide dogs are capable of detecting problems or obstacles along the trail, so the warnings in section *A2.1* apply for this category as well.

A2.3 Eyesight traits and limitations

Visual perception is a mix of different skills, such as visual field, visual acuity, light, colour, depth and motion perception, etc.

A2.3a Visual field

The approximate **visual field** of a human eye, compared to the point of focus, i.e. the point where the vision is focused, differs depending on the anatomy of the face and usually extends 30° superiorly, 70° inferiorly, 45° nasally and 100° temporally.

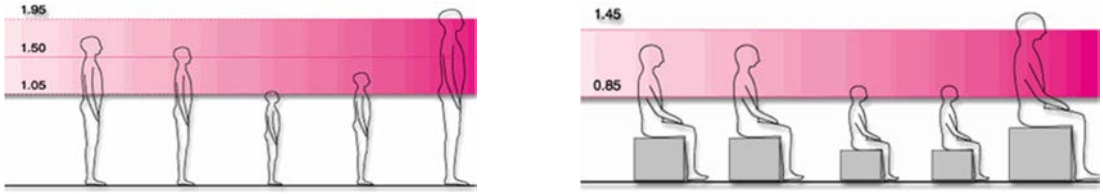


Figure 11. Common zone of comfortable vision in a sitting and standing position (in m)
Source: Ministry of Environment and Energy – Greece (1997)

To determine the loss of visual field, the following categories are often used:

- no limitation: **≥60°** (to the left and right)
- mild limitation: **60°** to **40°**
- moderate limitation (hemianopsia): **40°** to **20°**
- severe limitation: **20°** to **8°**
- high limitation: **8°** to **4°**
- complete or nearly complete limitation (blindness): **<4°**

⚠ Given that persons with partial vision may have a limited visual field, either due to complete limitation in one eye or due to partial limitation in both eyes (bilateral hemianopsia), it is recommended that environments (installation of elements, signage, etc.) are designed **at least** based on a limited visual field that extends to 30° superiorly, 70° inferiorly and 45° towards the right and the left.

A2.3b Visual acuity

Visual acuity (i.e. how clearly ones sees) may differ significantly from one person to the next, but also from one eye to other on the same person. Visual acuity is measured quantitatively by checking the smallest object (e.g. through standardised eye charts) the person may distinguish at a given distance and for each eye separately. Modern studies have shown that in elderly individuals (>65 years) without any pathological findings, average visual acuity is 10/10 (i.e. at 6 m they can distinguish shapes that are 1.75 mm apart), while this is much higher for the average natural eye of people of younger ages, at least 1.2 to 1.8 decimal acuity. **Low vision** is around 5/10 and in this case they have the same ability to distinguish the same objects as a person with 10/10 vision if they come half-way closer.

Figure 12. Minimum font sizes depending on distance (e.g. in cases of signage)
Source: Ministry of Environment and Energy – Greece (1997)

Specifically, vision loss is distinguished as follows:

- no vision loss: **≥0.8**
- mild vision loss: **0.8** to **0.3**
- moderate vision loss: **0.3** to **0.125**
- severe vision loss: **0.125** to **0.05**[7]
- high vision loss: **0.05** to **0.02**
- complete or nearly complete vision loss (total blindness): **<0.02**

Depending on the levels of visual acuity of a person, the font size in a text and the distance of the person from it significantly affect the reading ability and speed of that person, and as a result they need aids (glasses, magnifiers, etc.) or alternative non-visual solutions.

Given that many people demonstrate mild or moderate acuity even when using aids, it is recommended that environments (installation of elements, signage, etc.) are designed **at least** based on low vision of the order of 0.5 (double the sizes and half the distances needed by people with 10/10 vision).

Also given that some people may demonstrate severe acuity even when using aids, it is further recommended, beyond the recommendation above (to design for 5/10 vision), so as to ensure the clear approachability of a person (their eyes) to at least 1/10 of the normal distance.

[7] For example, they must be at a distance of 0.5 m to distinguish what a person with 10/10 vision sees at 6 m.

A2.3c Light/colour contrast perception

Another vision trait is the ability to distinguish characteristics when the contrast (grey tone) is different. Various tests measure contrast sensitivity and are just as important in evaluating the quality of vision of a person, as it may differ significantly from person to person for various reasons. Therefore, the correct levels of colour contrast are quite significant when it comes to accessibility.

⚠ Magnify the brightness between the foreground and the background and avoid the adjoining use of colours of the same brightness, even if they differ in terms of fullness or hue[8] (see examples in *Figure 13*). Avoid contrasts with colours from adjoining parts of the hue circle (see right part of the figure) when there is no sharp contrast in brightness.

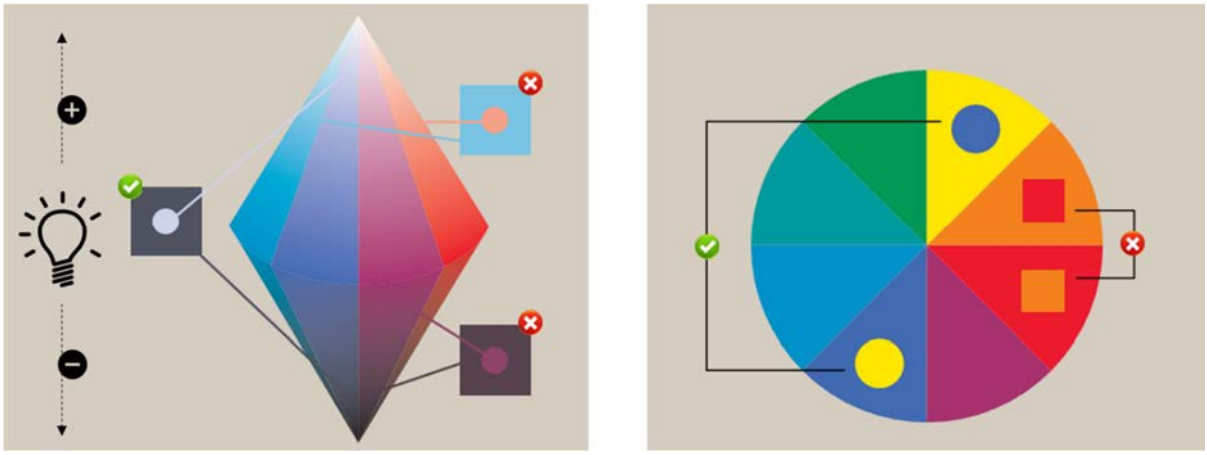


Figure 13. Magnify the brightness between the foreground and the background

⚠ The texts should have the highest possible contrast. Studies have shown that elderly readers and readers with partial vision are more comfortable with bright letters (white or light yellow) on a dark background (black or dark blue) rather than dark letters (e.g. black) on a light background (e.g. white). However, the traditional black on white may be aesthetically better (see examples in *Figure 14*). It is recommended to use contrast ratios at least higher than **4.5:1**, or even better **7:1**[9].

Figure 14. Use the maximum possible contrast between fonts and background

[8] For further examples: https://www.canva.com/learn/contrasting-colors/

[9] You can calculate the contrast ratio using various tools, e.g. https://webaim.org/resources/contrastchecker/)

A2.3d Colour perception

Another quite common congenital vision disorder is colour vision deficiency, i.e. inability to perceive colours (with greater occurrence in men rather than in women). There are many types of colour vision deficiency, depending on the colours (red, green or blue) the eye cannot see (daltonism):

- inability to perceive the colour red (protanopia) or green (deuteranopia) and, by extension, inability to distinguish between these two colours – usual forms,
- inability to perceive the colour blue (tritanopia) and, by extension, inability to distinguish between blue and yellow – unusual form,
- inability to perceive the colours red, green and blue (complete colour blindness, i.e. black and white vision) – extremely rare form.

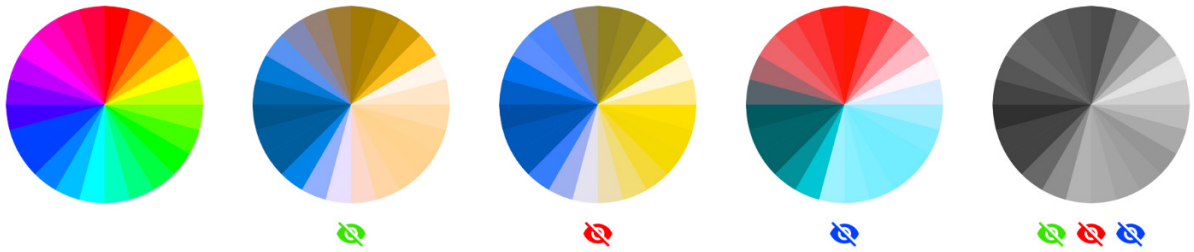


Figure 15. From the left: Normal vision, deuteranopia, protanopia, tritanopia, colour blindness

8 in 100 visitors may have some form of colour blindness. In addition, in low lighting situations, the human eye has difficulty or cannot distinguish colours, as is the case with the disorders above. Difficulties, as well as eye fatigue, can also be caused by bright light.

Colour should not be the only way to transmit information or messages. When colour is used to differentiate elements, additional markings not based on colour should also be used. For example, colour coding of areas on a map is not enough and clear limits, pattern fills and/or labels must also be used to distinguish the areas. Also avoid the following colour combinations: green-red, green-brown, blue-purples, green-blue, light green-yellow, blue-grey, green-grey, green-black.

A3 Data about persons with hearing impairment and deaf persons

Persons with hearing impairment are mainly distinguished between hard of hearing and deaf:

- Hard of hearing individuals may have difficulty in perceiving speech by hearing alone, whether they wear a hearing aid or not. However, they do perceive the largest part of information conveyed orally through their hearing. The hearing loss in these cases is between 35dB and 69dB HL (in one or both ears).
- Deaf individuals do not perceive speech by hearing alone, whether they wear a hearing aid or not. They mainly use the visual channel to perceive the people they talk to (lip reading, sign language, written speech). The hearing loss in these cases is over 70B HL (in

both ears). Prelingual deaf individuals (i.e. those who lost their hearing before the age of 2-3, when the main structure of language is acquired) have different traits to post-lingual deaf individuals, who lost their hearing after having acquired the main structure of oral language.

Around 10% of the population globally are hard of hearing and there are three main types:

- **Sensorineural hearing loss** causes reduction and distortion of the sound entering the ear and makes understanding words quite difficult. This is due to damage caused to the ear cochlea or the neural paths between the cochlea and the brain. This affects the sound level and clarity of the words and voices the person hears.
- **Conductive hearing loss** affects the outer and/or inner ears and creates the sense of reduced sound levels. The sound is met with obstacles upon entering the ear and as a result, the sound level is reduced when it reaches the brain.
- **Mixed hearing loss** is a combination of sensorineural and conductive hearing loss. Upon entering the ear, and throughout the path it follows until it reaches the brain, sound may be met with obstacles and its level may decrease.

Specifically, hearing loss is distinguished as follows:

- mild hearing loss: **15** to **30dB HL**
- moderate hearing loss: **30** to **50dB HL**
- severe hearing loss: **50** to **80dB HL**
- high hearing loss: **80** to **0100dB HL**
- complete or nearly complete hearing loss (total deafness): **<100dB HL**

Sound should not be the only way to transmit information or messages. When using audio messages and information, additional ways of transmitting it via visual channels should also be used.

When using audio communication/messages, in cases of artificial sounds, the focus should be on upgrading the quality – **not** the level – of the sound, and to aim for maximising the sound / speech-noise quantitative relationship in general.

B. ACCESSIBLE ECOTRAIL

For the purposes of this Guidebook, an "accessible ecotrail" is a trail for pedestrians, including persons using wheelchairs, in the natural environment, with suitable dimensions and slopes, without steps and obstacles, which ensures uninterrupted, safe and autonomous movement for the greatest possible part of users.

It includes accessible paths/trails and/or bridges, which pass through or connect accessible areas, as well as accessible rest areas, areas for manoeuvres, viewing areas, points of interest (natural or man-made), facilities (e.g. observation decks, reception kiosks, information kiosks, parking areas, etc.), signage, etc., creating a chain of accessible infrastructures and activities suitable for all, including persons with disabilities.

The design of short, accessible ecotrails, around 2 km in length, is proposed *(Ministry of Environment and Energy – Greece, 2017:28)*.

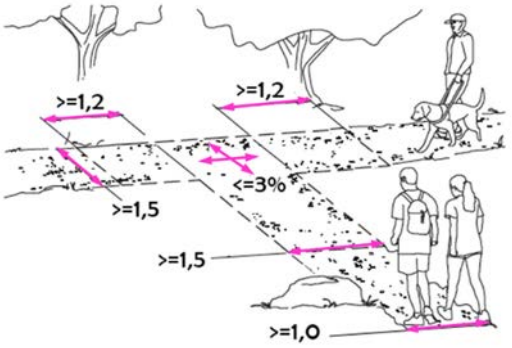
The following guidelines for designing accessible ecotrails are proposals/ recommendations in accordance with and/or on top of the institutional obligations stemming from the relevant legislation of both countries, which should form the foundation for any design.

B1 Paths

B1.1 Features of accessible paths

An accessible path is a path:

- with a clear width of at least 1.50 m all along the trail, so as to allow simultaneous movement of pedestrians and wheelchair users and/or two people on foot (e.g. a blind and an accompanying person), ideally 2.50 m, and at least 1 m locally (provided the morphology of the ground does not permit a width of 1.50 m),
- with no more than a 3-5% slope all along the trail, and with frequent (e.g. every 10-15 m) interspersed spots without inclination for resting) and up to 7% locally (for parts not longer than 5 m),
- with a maximum transverse slope of 2-3%, and up to 5% locally,
- with a level, without steps, continuous, smooth, stable (e.g. firm soil) and non-slip surface, well compressed and drained,
- without any kind of obstacles (including gaps, protrusions, holes, channels) all along the path and up to at least 2.30 m in height (including branches and signposts).



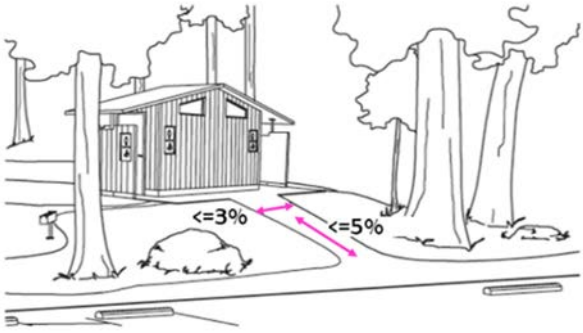


Figure 16. Minimum path widths (in m) **Figure 17. Minimum path slopes**

Adapted from: United States Department of Agriculture (2012: Fig. 135 & 37)

To ensure comfortable passage of two wheelchair users of any type (manual and/or motorised, which have larger dimensions than the manual) moving along the path in opposite directions, as well as the ability of wheelchair users to turn, the width of the path should be 2.20 m for 5 m every 100 m along the path *(Ministry of Environment and Energy – Greece, 2017:28)*.

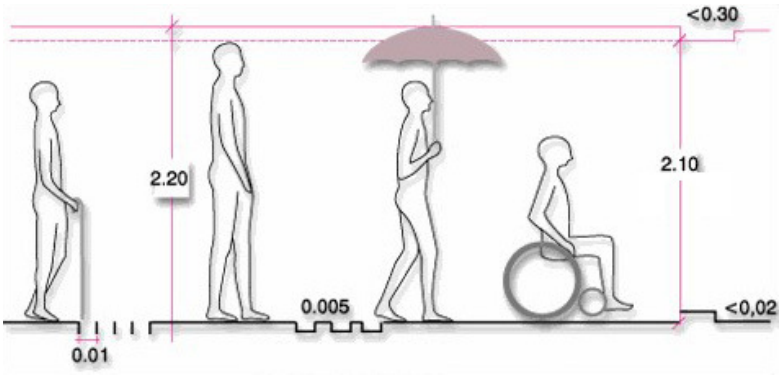


Figure 18. Free passage height (in m) and tolerable surface distortions

Source: Ministry of Environment and Energy – Greece (1997)

Loose ground, such as soft soil, sand, etc., is absolutely unsuitable, while surfaces covered with paving stones or gravel are not indicated for wheelchair users or pedestrians with disabilities.

To facilitate the movement and orientation of persons with visual impairment and to prevent the wheelchair users from overturning or the persons who use crutches from falling, a type of side guard made of wood, stone, etc. should be placed on both sides of the path all along, around 10 cm high.

Railing made of wood, stone and/or metal should be placed at least on one side of the path *(Ministry of Environment and Energy – Greece, 2017:28)*, with a continuous horizontal handrail, to assist persons with physical disabilities and/or vision impairment.

Handrails should be placed at two heights (90 cm and 70 cm), so as to also assist shorter individuals, children, etc. At dangerous spots, the railing should be at least 1.20 m high.

Both the side guard and the railing must continue all around (on 3 sides) in rest and viewing areas, leaving, of course, free the side where you gain access to these areas from the path.

If there are provisions for grates to cover holes (e.g. water drainage channels), the grate openings should not be greater than 1 cm either way, while their surface, once closed, should be on the same level as the surface of the path.

The openings should be placed perpendicular to the flow of movement, to avoid wheelchair wheels, white canes and any other artificial aids used by persons with disabilities from getting stuck.

It is also recommended that they are placed outside the clear width of the path.

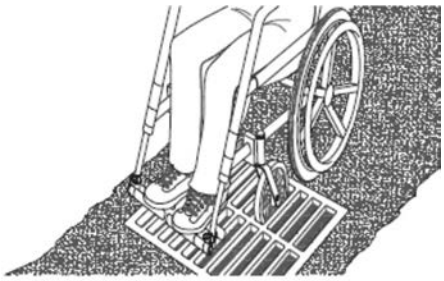


Figure 19. Inappropriate grate placement
Source: United States Department of Agriculture (2012: Fig. 43)

In general, all efforts should be expended to create a trail with the features outlined above in all the important spots (viewing, rest, recreational areas, etc.) and in any buildings, constructions, mechanisms, equipment, etc.

B1.2 Bridges

In the event of connecting the path to existing and/or new bridges, the following are recommended:

- The bridge should be at least 0.90-1.00 m wide (if already existing) or 1.50 m wide (if it is a new construction), with a desirable slope of 5% – and not greater than 7% for up to 5 m – and with guard rails on both sides.
- If the surface of the bridge is made of wood, the gaps (joints) between the planks should not exceed 1 cm.
- The bridge should be connected to the path with a ramp with a maximum slope of 5% and guard rails on both sides. There should be no height difference between the end of the ramp and the path.

B1.3 The significance of path maintenance

Regular maintenance of the paths is extremely important and should at least include:

- Clearing the path by removing rubbish, debris and vegetation, such as removing fallen trees or broken off branches, weeds, debris (gravel, stones, etc.).
- Maintaining/repairing the path surface, such as filling any large holes/joints, constructing supports or encasing the surface layer (e.g. side guards) of the path.
- Conducting inspections for erosion or drainage, such as constructing/repairing the drainage or drainpipe system.
- Repairing or replacing damaged or vandalised paths or construction parts, including parts of bridges, information kiosks, fences and guard rails, benches, signage, etc.

B2 Rest areas

Rest areas for the path users should be constructed every 100 m to 200 m along the accessible path, outside the clear width of the trail, as an extension.

When constructing rest areas for wheelchair users parallel to the direction of movement, a free area 1.30-1.60 m long[10] and at least 0.8 m wide should be created outside the clear width of the path and as an extension, with a continuous, smooth and firm surface, and a slope up to 2% towards any direction.

However, wherever possible, it is recommended to construct rest areas with larger dimensions than the ones mentioned above, addressed to all users, including wheelchair users, outside the clear width of the path and as an extension, which shall be equipped with conventional seating for path users and will have free space next to the conventional seating, measuring at least 0.8 m x 1.3 m, for the wheelchair user to rest.

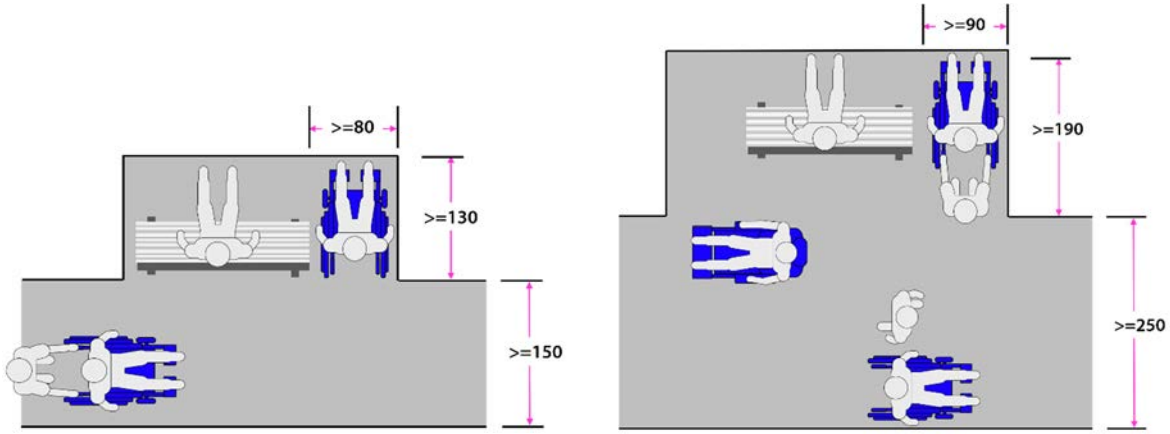


Figure 20. Minimum (left) and ideal (right) dimensions for rest areas as an extension to the paths (in cm)

It is recommended that the conventional seating (benches) is 43-48 cm high and has a back along its length and arms on both sides or at least one arm on one side and/or in the middle to assist people who have difficulty sitting down or getting up.

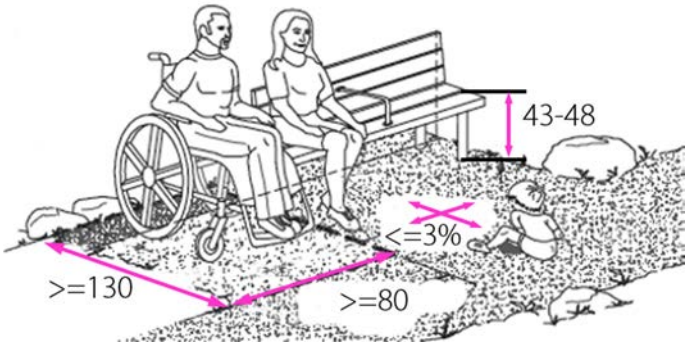


Figure 21. Minimum slopes and dimensions for rest areas as an extension to the paths (in cm)

[10] Given that for a wheelchair to stop at an indentation parallel to the direction of movement, approximately an additional 0.30 m are required on top of the 1.30 m length for manoeuvres (see ADA Accessibility Guidelines – ADAAG, Appendix A to Part 1191, 4.2 Space Allowance and Reach Ranges).

B3 Manoeuvring areas

When it is not possible to ensure the ideal surface area of over 2.50 m in diameter for a complete, on-the-spot turn of a wheelchair user, then the desirable free space should be 1.80 m in diameter, and in all events at least 1.50 m in diameter.

Rest and manoeuvring areas may overlap, provided that the aforementioned required free space for manoeuvring is ensured and the ground slope does not exceed 2% in all directions.

In the event of a wheelchair user manoeuvring around an obstacle, the minimum width of the free passage space depends on the size of the obstacle.

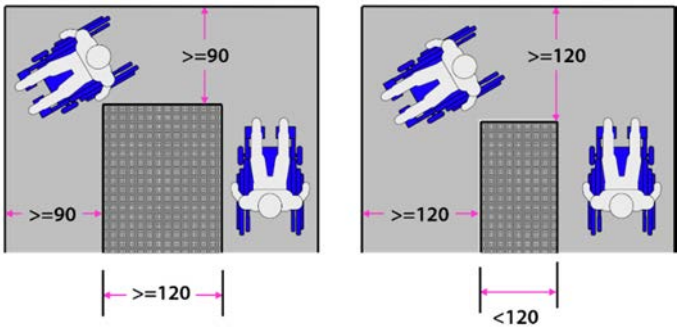


Figure 22. Minimum required dimensions for a wheelchair user to manoeuvre around an obstacle (in cm)
Source: Ministry of Regional Development and Public Works – Bulgaria (2009)

B4 Viewing areas

Accessible viewing areas may be constructed at points of interest with a great view, outside the accessible trail and in contact with it. The ground surface should be continuous, smooth, firm and non-slip, with a maximum slope up to 2% in all directions, at the same level as the path or connected to it with a ramp with a maximum slope of 5%.

A free space with minimum dimensions of 0.80 m x 1.30 m should be available at the viewing areas for wheelchair users who want to stop, as well as an area with a diameter of at least 1.50 m (desirable diameter 1.80 m) for the wheelchair users to be able to turn. The viewing areas should have a guard rail at least 0.90 m high all around. Materials that permit viewing for persons using wheelchairs or shorter individuals should be used to construct the guard rail.

Figure 23. Viewing area, Habitat Education Center & Wildlife Sanctuary, USA
Source: Gertz Lucy, Weinreb Stu, Scopinich Kris, Clayton Gary, Berrier Jerry, Charlson Kim, et al. (2016)

B5 Recreational areas

For persons with disabilities to be able to use the recreational areas, these areas must be connected to the accessible ecotrail with accessible paths (see section *B1.1 Features of accessible paths*) and the access of wheelchair users should be ensured for the most part of their surface area. At the accessible parts, the slope should not exceed 2% in all directions, while the surface of these parts at least should be level, without steps, continuous, smooth, stable (e.g. firm soil), non-slip, well compressed and drained, without any kind of obstacles (including gaps, protrusions, holes, channels, etc.) up to at least 2.30 m in height. Any equipment (picnic tables, benches, water supply, etc.) available in the recreational areas should be accessible to all (see section *B6 Equipment*).

B6 Equipment

Any equipment that may be placed in rest areas, viewing areas, recreational areas and/or parking areas must be accessible and must be able to be detected and used by all users. Level, accessible paths (see section *B1.1 Features of accessible paths*) should connect the areas where the equipment is located to the main trail.

When installing picnic tables, there should be at least one space available for a wheelchair user on each table. This means that there is a free space measuring 0.80 m x 0.75 m x 0.50 m (width x height x depth), without joints, under the surface of the table, allowing the unimpeded access of the wheelchair user to it.

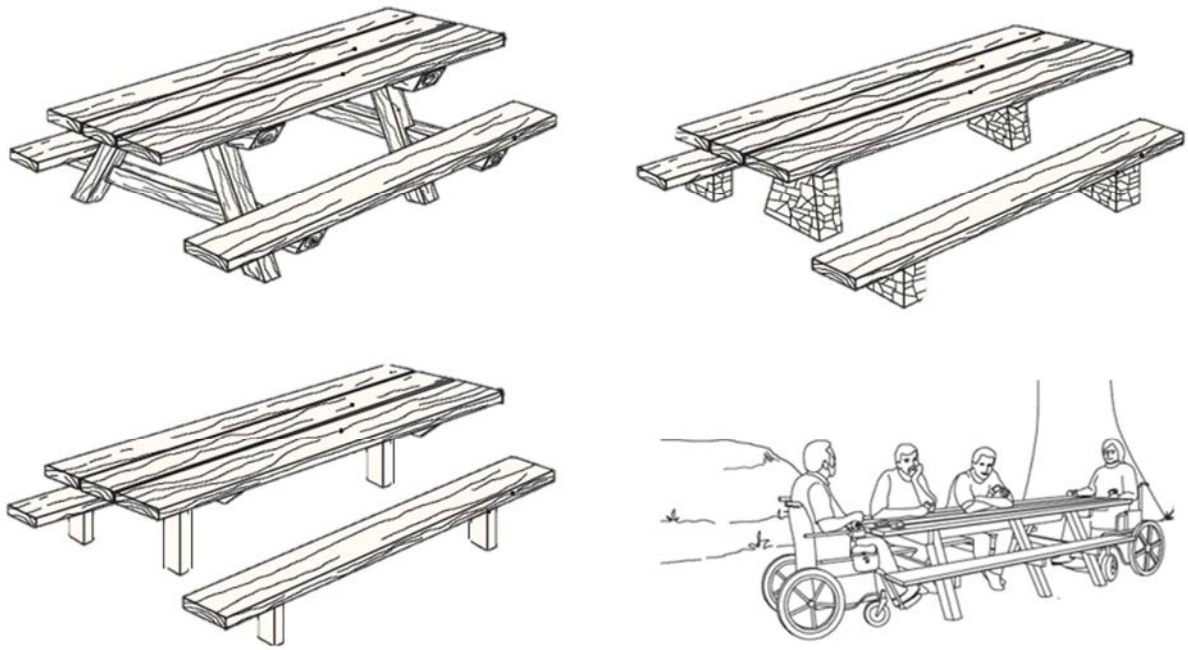


Figure 24. Picnic table designs with places for wheelchairs
Source: United States Department of Agriculture (2012: Fig. 83-84 and 78)

Rubbish bins may be placed at the parking areas. However, this should be done only if rubbish collection by a relevant agency (forestry authority, operator, municipality or other agency) is available. This option is not often available, so in this case, it would be advisable to place discreet good conduct signs, urging visitors to take their rubbish with them when leaving. It is forbidden to place rubbish bins along the paths (Ministry of Environment and Energy – Greece, 2017:28).

If rubbish bins are placed, they must be placed at a spot (accessible to persons using wheelchairs, with free space at least 1.50 m x 1.50 m in front of the bin, and easily detected by persons with visual impairment) and at a height that the rubbish receptacles are accessible to persons using wheelchairs (0.90-1.20 m recommended distance from the ground).

The installation of phone equipment for public use, including emergency phones, must comply with the national specifications. The phones should be accessible to persons using wheelchairs, have a volume adjustment and, if possible, should be accompanied by installed phones for the deaf.

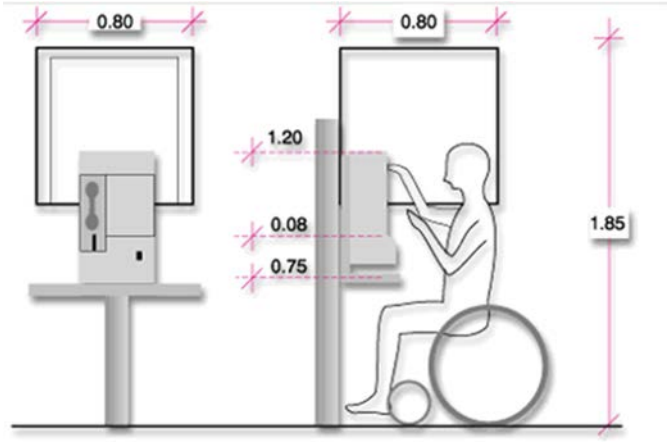


Figure 25. Dimensions of phones accessible to persons using wheelchairs (in m)
Source: Ministry of Environment and Energy – Greece (1997)

Drinking fountains or other spots with drinking water must also accommodate persons using wheelchairs and it is recommended that they carry accessible signs with information about the quality of the water.

Figure 26. Example of accessible drinking fountain
Source: United States Department of Agriculture (2012: Fig. 33)

For control mechanisms to be accessible by persons using wheelchairs, they must be installed at a 0.90-1.20 m zone from the ground, with provision for a free area under the surface for the user's legs, measuring 0.80 m x 0.75 m x 0.50 m (width x height x depth). Any telescopes, periscopes, etc. must be installed at a height of 1.10-1.30 m from the ground, suitable for persons using wheelchairs.

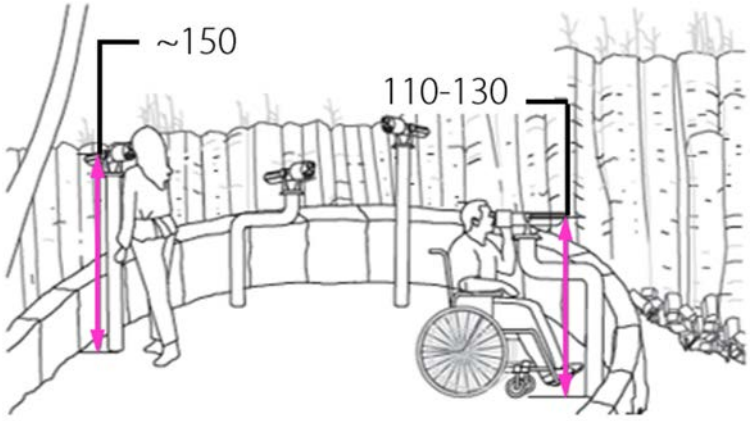


Figure 27. Example of periscopes for persons using wheelchairs (measurements in cm)
Adapted from: United States Department of Agriculture (2012: Fig. 97)

C. FACILITIES

C1 Observation decks

Observation decks should be accessed through an accessible, level path (see section *B1.1 Features of accessible paths*), or a ramp with a maximum slope of 5%. Access exclusively via a staircase renders the observation deck inaccessible to a large part of visitors with reduced mobility. The entry door must have a clear width of at least 0.90 cm, so as to ensure easy entry to wheelchair users.

The interior of the observation deck must ensure unobstructed movements and manoeuvres of wheelchair users, who must have access to the observation wall without being obstructed by fixed seating or steps. At least one observation position (two would be desirable) must be specially designed and have an indentation with the right dimensions so as to host the front wheels of a wheelchair (see *Figure 28*).

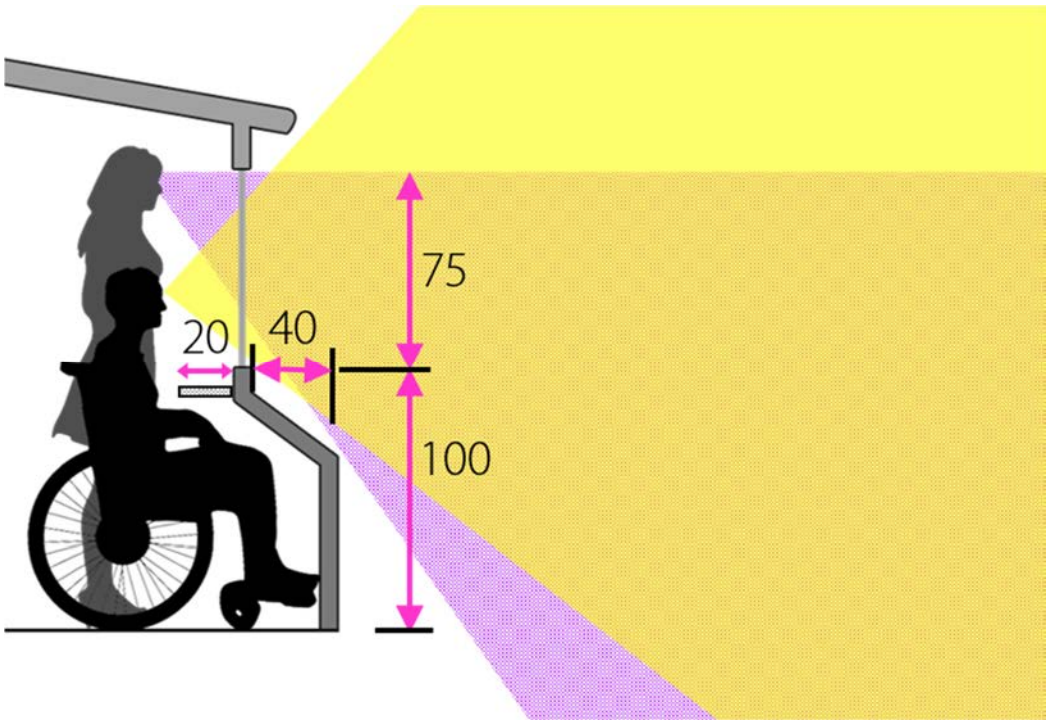


Figure 28. Accessible observation deck (measurements in m)
Adapted from: Shanks Bob, Bird Observers Club of Australia (1998)

C2 Reception and information kiosks

Reception and information kiosks should be accessed through a level path or a ramp with a maximum slope of 5%.

As to the individual areas and elements of the reception and information kiosks, they must be designed in compliance with the national standards for accessibility to public use buildings for each country (see "Introduction", section *Main accessibility framework in the Programme countries*).

Some of the main points that must be taken into consideration so as to ensure accessibility are listed below (the list is not exhaustive):

- Accessible path connecting the kiosk to the trail and the other facilities.
- The entry door must be clearly visible, level to the path or have a ramp with a maximum slope of 5%, which should end on a horizontal landing at least 1.50 m x 1.50 m. A canopy is recommended. The minimum clear width of the entry door must permit the entry of a wheelchair user, i.e. be at least 0.90 m.
    - In the event of a double entry door, at least one of the doors must be 0.90 m wide.
    - In the event of a glass entry door, the glass surfaces must be marked with adhesive tape or any other manner that prevents accidents to persons with visual impairment.
- The corridors inside the building must have a minimum clear width of 0.90m and at least 1.20 m when there are doors along them. For corridor widths less than 1.50 m, there should be manoeuvring areas available for wheelchair users (1.50 m in diameter).
- The interior doors must have a minimum width of 0.90 m and bear relevant signs relating to the use of the areas, both in conventional writing and in Braille.
- If there is another level, along with the stairs, vertical access for persons with disabilities should be ensured, with accessible lift or platform lift.
    - An accessible lift is a lift with clear cubicle dimensions of 1.10 m x 1.40 m, with a door with a minimum width of 0.80 m on the short side, raised numbers and Braille characters on the buttons, visual and audio indicators to announce arrival, and free space for manoeuvres measuring at least 1.50 m x 1.50 m in front of the cubicle door in the corridor.
    - An accessible platform lift is a lift that moves vertically or along a staircase with platform dimensions of at least 0.80 m x 1.30 m and free space for manoeuvres measuring at least 1.50 m x 1.50 m at the platform entry/exit points in the corridor, which is CE certified.
    - Existing staircases must have contrast strips at the edge of the steps, double handrails at a height of 0.90 m and 0.75 m from the surface on both sides of the staircase, which will continue on to the landing and will protrude 0.30 m from the top and the bottom of the staircase.
- Special attention should be paid to the structural and architectural elements (e.g. colour contrast between shutters and casings, walls and floors, etc.) and the area lighting, so as to assist persons with visual impairment.
- Non-slip floors, preferably without carpet.
- Marked glass surfaces.
- Marked protrusions, projected on the floor, so that they are detectable by the white canes used by blind persons.

Attention should also be paid to the following:

- Any showrooms should be accessible to all. The exhibits should be placed at a height that can be approached and examined by persons using wheelchairs, while any informational labels must be written in simple and easy-to-understand text, and in Braille.
- The labels in Braille must be placed at a height suitable for touch reading by persons with visual impairment. There should also be provisions in place for tactile exhibits and/or maps for blind persons.
- Informational material should be available in accessible forms (e.g. Braille, large font, easy-to-read format[11], tactile maps, DVDs with subtitles or sign language, CDs, etc.).
- Any websites should meet the international accessibility standards. Compliance to the *Web Content Accessibility Guidelines*, version 2.0 or later, of the World Wide Web Consortium (W3C) is required, at least to level AA (compliance to level AAA, the highest level of web accessibility, is desired).
- Any IT applications should also be accessible by persons with disabilities.
- Any tours or screenings should meet all the needs (e.g. tour with sign-language interpreting or subtitles depending on the case, audio tour for blind persons, etc.).
- Entry to assistance dogs must be permitted.
- The staff must be trained on the main principles for communicating and serving persons with disabilities.

C3 Parking areas

The parking areas are designed in compliance with the corresponding national accessibility standards of each country, in terms of the dimensions of their individual elements and their signage.

However, in addition to the conventional parking spaces for persons with disabilities, parking spaces for vans and vehicles providing access to wheelchairs on the back (at least one space) are recommended, with minimum required dimensions of 4.50 m x 6.60 m.

It is recommended that the parking areas are placed as close as possible (no more than 50 m away) from the end and/or start of the ecotrail, the reception kiosk, the information kiosk or any other area they serve.

An accessible path should connect the accessible parking areas to the end and/or start of the ecotrail and/or the facilities located close to them (reception kiosk, information kiosk, restrooms, etc.).

[11] The "easy-to-read" term refers to text with simple vocabulary and syntax that is understood by everyone, including persons with intellectual/cognitive disabilities. To write such texts, see "Information for all – European standards for making information easy to read and understand", available on https://easy-to-read.eu/wp-content/uploads/2014/12/EN_Information_for_all.pdf

C4 Bus stops

In the event that the end/start of the accessible ecotrail, the reception kiosk, the information kiosk and the other facilities may be accessed by bus, it is recommended that the modes of transport (buses) and the corresponding stops are accessible.

The bus stops should be as close as possible to the areas they serve, be connected to them via an accessible path, be covered, be accessible by wheelchair users (e.g. if they are on a pavement, there must be a ramp in place, with the right width and height to facilitate drop off / pick up), have at least one covered area measuring at least 0.80 m x 1.30 m for wheelchair users to stop, and be easily detected by persons with visual impairment (e.g. have brightly coloured elements, tactile walking surface indicators for the blind, etc.). It is recommended that any posted route schedules are also available in Braille or announced to passengers via audio applications.

C5 Restrooms

The restrooms may be located at the reception kiosk, the information kiosk, the observation deck and/or an independent and accessible building. In all events, an accessible path must lead to the restrooms. The restrooms must have sufficient space for the wheelchair user to turn so as to be considered accessible, with the washbasin either in the same area or outside the cubicle. In the event that the turning space and the washbasin are located outside the cubicle, then there must be a free area for turning in front of the door to the cubicle, with minimum dimensions of 1.50 m x 1.50 m or 1.50 m in diameter. In the event that the turning space and the washbasin are located within the cubicle, then there must be a free area for turning with minimum dimensions of 1.50 m in diameter or 1.50 m x 1.50 m within the cubicle.

In all events, the following are recommended:

- The door must be at least 0.80 m wide and open outwards.
- On one side of the toilet bowl, where the wheelchair user approaches it, there must be a free space at least 0.90 m wide. Nothing should be placed in this space, not even a rubbish bin.
- Grab bars must be placed on both sides of the toilet bowl; the one on the side where the wheelchair user approaches the toilet bowl must be vertical. The mounting lengths and heights of grab bars are specified in the national specifications of the two countries.
- Washbasins for persons using wheelchairs must not have a stand and the lower surface must be at a height of 0.70 m from the floor.
- The mirror must be tilted or placed with the bottom part touching the upper surface of the washbasin.
- Apart from the restroom sign, the door must also feature a tactile *International Symbol of Access* (see section *D3 Accessibility signage*), placed on the adjoining wall, at a height of 1.40-1.60 m from the floor.
- Hooks must be placed at a height of 1.20 m and 1.80 m from the floor.

In general, it is best to place the washbasin in the cubicle, given that this way, it better serves persons with physical disabilities and/or chronic conditions in terms of hygiene. In all events, the implemented solution must be compatible with the national specifications for each country.

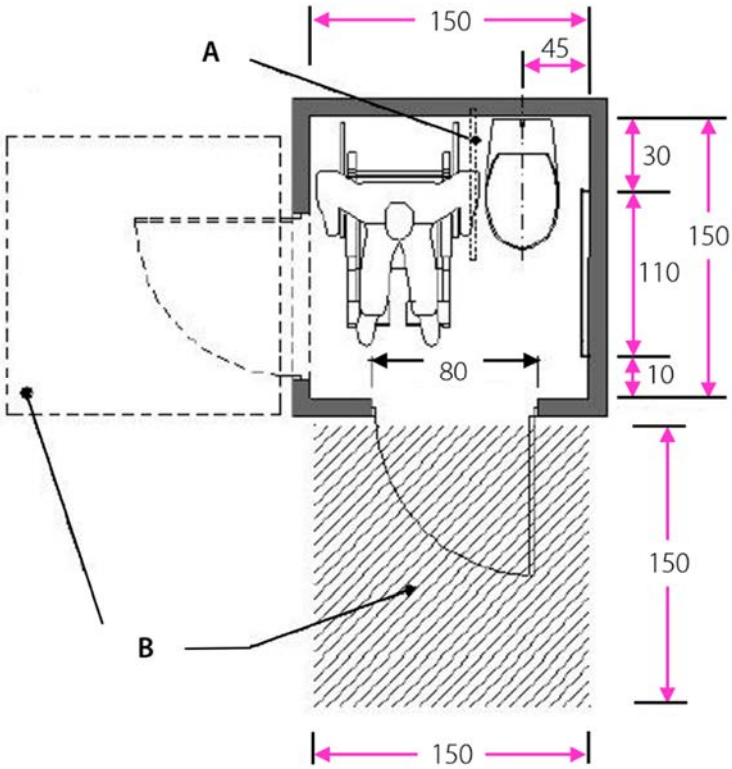
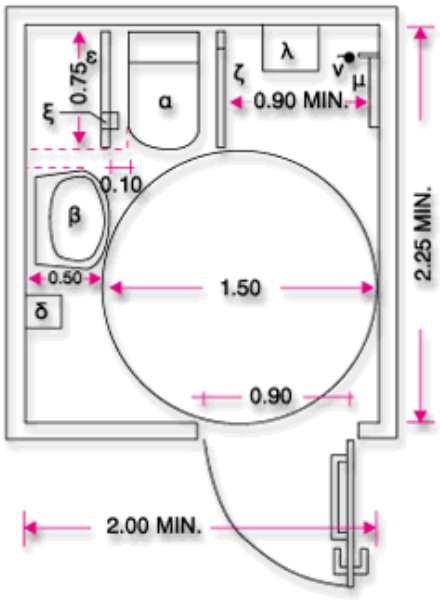


Figure 29. Restroom with turning space and washbasin outside the cubicle (measurements in cm)
Reproduced from: Ministry of Regional Development and Public Works – Bulgaria (2009)



α = toilet bowl
β = washbasin
γ = mirror
δ = paper towel dispenser or hand dryer system
ε = horizontal grab bar
ζ = retractable grab bar
η = vertical grab bar
κ = slope system
λ = lowered seat (if there is also a shower)
μ = position of shower head, grab bar, soap dish
ν = drain
ξ = tissue paper dispenser

Figure 30. Restroom with turning space and washbasin inside the cubicle (measurements in m)
Source: Ministry of Environment and Energy – Greece (1997)

D. SIGNAGE

The term "signage" refers to all the messages and information placed in an environment for users to orient themselves, find a trail, receive information and move safely, such as signs, maps, illuminated and audio signs, differentiated materials by colour and/or texture, models, etc. Depending on their position and form, they are on posts, on the ground, on walls, hanging, etc., as well as written, illuminated, tactile, audio, etc.

Depending on their function (signs mainly), they provide:

- **directions**: arrows pointing to a specific facility,
- **names**: to recognise an area/trail,
- **descriptions**: for the nature of a facility (accessible entry, women's restrooms, parking area, etc.),
- **orientation**: top view or model of a plan or outline,
- **information/guidance**: information and/or instructions for a location/facility,
- **warnings/regulations**: alerts when approaching dangerous spots or conduct in forbidden or private areas, etc.

D1 General

Generally, note that repeated signage about a specific piece of information must always appear in the same manner, so that it is recognised easily. Multiple signs, extended texts, combination or placement of advertising signs with informational signs must be avoided, as they cause confusion.

Attention must be paid to the way and the position the signs are placed, so they do not become an obstacle or pose a threat to certain categories of individuals, such as persons using wheelchairs or persons with visual impairment *(Ministry of Environment and Energy – Greece, 1997:6)*.

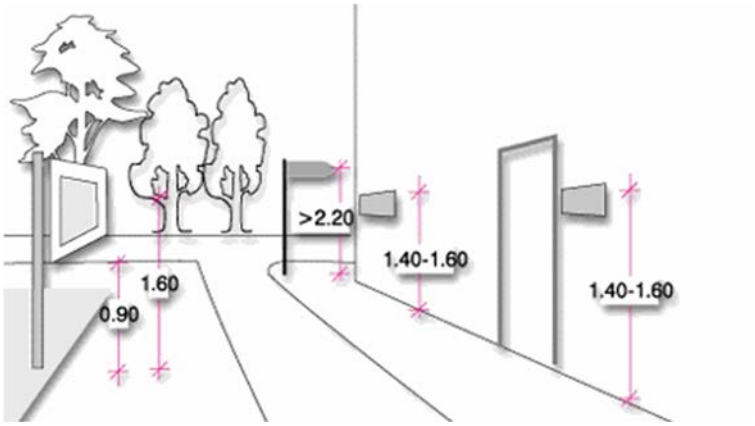
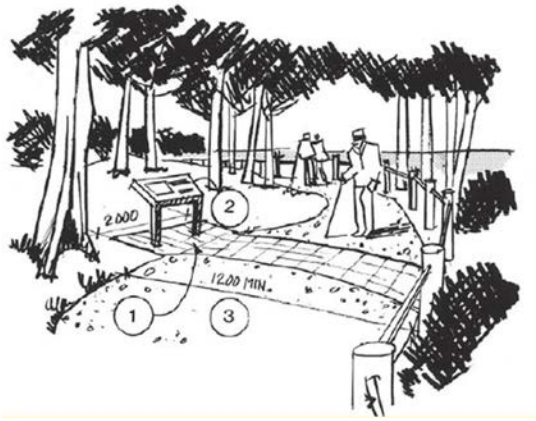


Figure 31. Sign position (measurements in m)
Source: Ministry of Environment and Energy – Greece (1997)

At the same time, however, the signs must be understood and accessed by / approachable to all users (e.g. connected to the main trail with accessible paths, mounted on surfaces similar to those of the paths, etc.). A free area must be available in front of the signs, measuring 1.50 m in diameter or 1.50 m x 1.50 m, wherever required, to assist wheelchair users to approach it (see *Figure 32*).



(1) = different texture surface, indicating the existence of a sign or something of interest

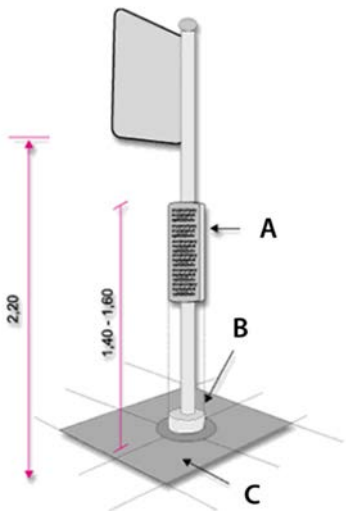
(2) = sign

(3) = minimum path width *(Note: for the purposes of this Guidebook, it is recommended that the minimum width is 1.50 m rather than the 1.20 m depicted in the figure)*

Figure 32. Example of sign placement (in mm)
Source: Commission de la Capitale Nationale, Canada (2010)

For signage to be perceived by persons with visual impairment, it must be tactile, i.e. in raised font or in Braille for blind people, and/or in larger font, suitable colours and sharp colour contrast for persons with partial vision loss (see sections *A2.3b Visual acuity*, *A2.3c Light/colour contrast perception* and *A2.3d Colour perception*). The sign surfaces must not be reflective (matte), of non-transparent material and in sharp colour contrast with the surrounding environment. The signs must be well-lit, but without light sources right behind them.

Especially in the case of tactile signs, special attention must be paid so that the sign surface is smooth, without any protrusions. For example, screws, nuts, nails, etc. used to secure the sign to the post must not protrude and cause injury upon touching. It is recommended that tactile signs, wall-mounted or on posts, are placed at a height that facilitates touching them (recommended sign placement height is 1.40-1.60 m above the surface of the ground), with fonts and symbols raised by 1.00-1.50 mm (see *Figure 33*).



(A) = Sign in raised font / Braille

(B) = Base of information projected on the ground

(C) = Obstacle warning

Figure 33. Tactile sign placement (measurements in m)
Source: Ministry of Environment and Energy – Greece (1997)

The use of standard typefaces with clearly legible font in upper-case or lower-case letters, sans serif, is recommended. Arial, Verdana and Helvetica are considered good options. Complicated, decorative, serif fonts, such as Times New Roman, or cursive fonts should not be used (European Blind Union, 2016:6). The height of the letters in interior signs should not be smaller than 15 mm. In exterior signs, it should not be smaller than 100 mm (legible at a distance of 3.00 m). In general, font and symbol size is determined by the distance at which it is required to be legible and understood *(Ministry of Environment and Energy – Greece, 1997:6 –* see *Figure 12)*.

The use of tactile text along with the use of pictograms is always recommended, given that persons with visual impairment cannot always recognise and understand tactile pictograms. Note that audio signs/information must always be combined with the corresponding visual signs/information, so as to be also understood by the deaf. Persons with intellectual/cognitive disabilities are more comfortable with signs that use simple and easily understood pictograms in bright colours, which, however – as already mentioned – must always be accompanied by simple, precise and easy-to-understand text, to meet the needs of other trail user categories (e.g. persons with visual impairment).

D2 Directional signage

Directional signage may indicate direction, position or notification (permanent or temporary) and mainly includes signs placed at road, path and trail intersections, with the aim of orientating and easily guiding visitors around individual parts of the area, and assisting their tour. Directional signage should be made of materials and colours specified in the national legislation of each country. Attention should be paid to the sharp colour contrast between the text / symbols / pictograms and the background.

Directional signs must be placed outside the clear width of the path, but in positions easily detected by persons with visual impairment. General directional signs must be placed perpendicular to the path direction and serve both directions. As an indication, the distance between signs could be 70 m, but, naturally, whether this distance is longer or shorter is determined in the field, depending on the course of the trail, the vegetation density, the intersections with other paths, etc. *(Ministry of Environment and Energy – Greece 2017:5)*.

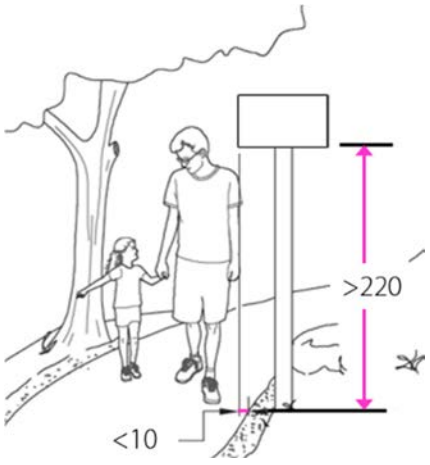


Figure 34. Directional sign placement (measurements in cm)
Adapted from: United States Department of Agriculture (2012: Fig. 45)

Tactile signs must definitely be repeated when the direction changes or where doubt could be created as to choosing the right trail. At times, a slate is placed on the path surface, in front of the signpost, which can be easily detected by the white cane of blind persons, so as to indicate to blind persons the existence of signage. Other techniques include a break in the side guard of the path, on each side of the tactile signpost (e.g. 0.50 m before and 0.50 m after) or a differentiation in the side guard at the position of the tactile sign (i.e. using different cross-sections of the same material as the side guard, such as same width/depth, but different height).

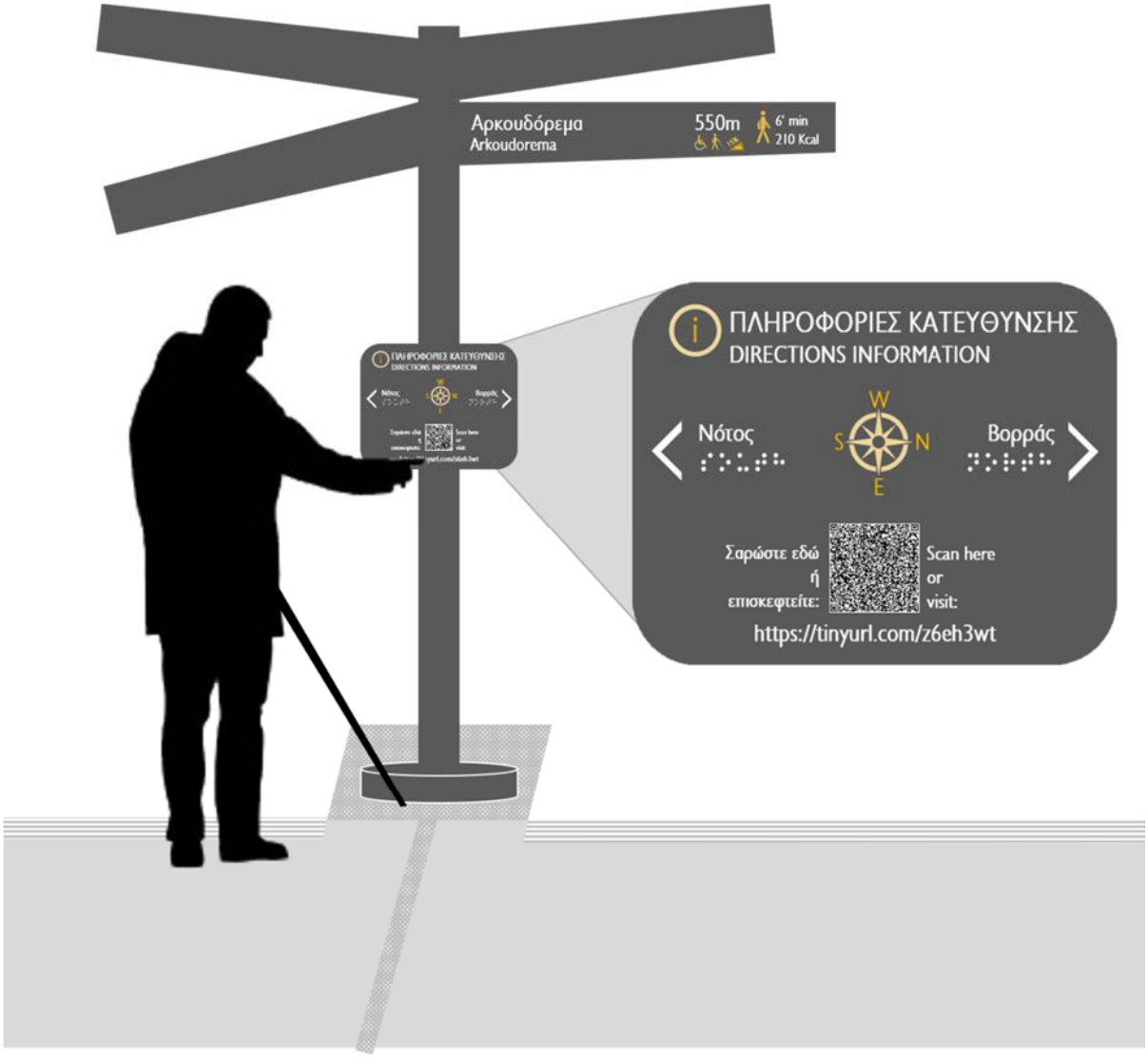


Figure 35. Example of accessible directional signage with tactile sign and additional provisions for the blind[12]

[12]The tactile sign provides to blind persons the same directional information as that provided to people who see, e.g. through QR code text, so users can have access to the message via mobile phone (without internet connection): "*Facing this sign, to the right (to the north) begins a path to Arkoudorema. Distance 550 m, approximately 6 minutes at normal walking speed (210 calories), accessible to blind and wheelchair users.*"

D3 Accessibility signage

Both directional and informational signage must be placed in ecotrails marked as accessible. The signage must be posted along the paths, as well as at facilities and any indoor areas (e.g. information kiosk), should meet the relevant needs and should be accessible to all potential users, including persons with disabilities. Note that if signage and provision of information contribute towards keeping citizens updated, oriented and safe, for persons with disabilities, they are a necessary condition for them to access, move around and stay in public areas and the natural environment in particular.

Note that the yardstick for designing and installing accessible signage are persons with sensory (sight and hearing) and intellectual/cognitive disabilities, due to their unique communication and informational needs – similarly to persons using wheelchairs, who are used as a yardstick for the dimensioning of spaces and equipment.

When the signage is addressed to persons with disabilities, it must be accompanied by the ***International Symbol of Access*** (*ISA*). The International Symbol of Access depicts a person on a wheelchair and is usually a white figure against a black/blue background or a black/blue figure against a white background, as specified in the ISO 7001:2007 international standard of the Information and Communication Technology (ICT) Accessibility Committee and the Rehabilitation International (RI) Committee. This standard lays down a series of symbols for the purpose of informing the public and is generally applied for all public information symbols in all locations and sectors accessible by the public.

Figure 36. International Symbol of Access

Many believe that the International Symbol of Access is a general symbol that must be used anywhere and at any time something is accessible, which is not necessarily correct.

This symbol may only be used in the following cases:

- Disabled parking areas
- Disabled restrooms
- Accessible swimming areas/facilities
- Accessible entry to a building/area
- Accessible evacuation/escape routes

Apart from the International Symbol of Access, the standard also has additional international symbols for affordances to person with disabilities, which must be used (accompanied by explanatory text wherever possible) in the following cases:

Figure 37. International symbol for information

Figure 38. International symbol for video with closed captions

Figure 39. International symbol to indicate sign language interpretation is available

Figure 40. International symbol for teletypewriter (also referred to as "TTY")

Figure 41. International symbol to indicate audio description is available

Figure 42. International symbol to indicate large print (18 point) material is available

Figure 43. International symbol for a telephone with volume control

Figure 44. International symbol to indicate an assistive listening system is available

Figure 45. International symbol to indicate materials are available in Braille

D4 Visitor information signage

All hikers, including those with disabilities, need information about the area and the local trails so as to make informed decisions. For example, they want to know which path is more suitable for the time they have at their disposal, the people in their group and the type of hiking that best meets their needs and desires.

Information regarding the accessibility of a path allows persons with disabilities to decide whether the features of the path are adjusted to their needs. When this information is available on accessible websites and brochures, they allow all hikers, including persons with disabilities, to comprehend the potential challenges of the trail before reaching the path. However, this information must be checked regularly, so that it responds to the actual conditions.

Therefore, it is recommended that – apart from typical information, such as the name and length of the trail – informational signs include information about trail accessibility, such as typical and maximum transverse slope of the path, typical and minimum width, surface type, location and distance between rest, turning, viewing and recreational areas, etc.

Given that informational signage does indeed aim at providing general information about the trail, but also providing additional information, such a points of interests and all types of sites along the way so as to pique the interest of users, it is recommended to have an information spot accessible

to all: (i) at the main entry points to the area (e.g. park), (ii) at the start/end of each complete path, and (iii) at the entry points to separate protected area zones (to inform visitors about the special rules that apply for protection, use and activities in each zone).

These spots must include at least one of the following:

- Welcome sign with information, in conventional and accessible format (e.g. Braille). It is recommended that the welcome sign is vertical to the ground or – even better – at a 45° to the vertical. Simple and easy-to-understand text in conventional and accessible format, combined with pictograms and audio messages covers the entire range of users with disabilities and is recommended on welcome signs.
- Maps with a simplified general design (in conventional and raised format) or a simplified raised model of the ecotrail, so users may get a general idea of the area. Rest, turning and viewing areas, points of interests, facilities, etc. must be marked on these.
- Adequate canopy to cover a person on wheelchair and their accompanying person.

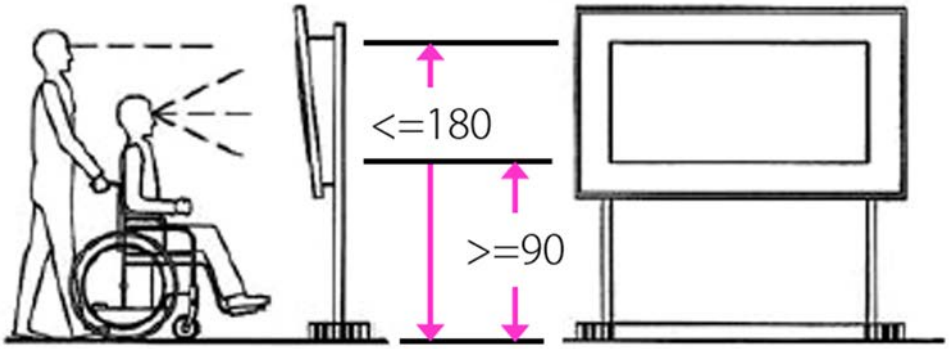


Figure 46. Map and informational sign reading by persons using wheelchairs (in cm)
Source: United Nations, SOLIDERE, ESCWA (2004)

If welcome signs, maps and models are mounted on a table (horizontal or sloped), it should be ensured that there is free space measuring at least 0.80 m x 0.75 m x 0.50 m (width x height x depth) under the table so they could be approached and read by wheelchair users.

D5 Signage about the environment

These are signs of tourist interest, which are placed in selected spots (viewing areas, observation decks, points of interest, in front of trees, plants, rocks, etc.), with the aim of informing and raising awareness among users for significant details about the natural and cultural environment, so they become aware of the multi-faceted importance of the area. In addition, on many occasions, they aim to highlight the special features of a path or a protected area in general.

For most visitors, these types of signs and information are of special interest, and proper provisions should be made so access to them does not exclude certain categories of visitors with disabilities, such as persons using wheelchairs, blind persons, etc. Ideally, given that it is usually impossible to have the information on a sign also available in Braille (as Braille takes up around three times the space of normal writing), the use of modern techniques and technologies is recommended, such as virtual tours, audio systems, etc.

Figure 47. Example of informational and directional signage accessible to all

A technique that is not very interventional to the environment (as it does not require power, special equipment, etc.) is to link the signs with information (i) coded in text QR codes and/or (ii) online.

In the first case, after users scan the code (which must be raised at the edges or the centre for touching) with their mobile device (mobile phone or tablet), they may listen to the coded text/information without an internet connection (4296 alphanumeric characters, i.e. around 800 words, max, see *Figure 35*).

In the second case, the area must support Wi-Fi or mobile data, so users may be directed to a website with the sign contents available in various formats (the address will be written on the sign or be coded with a URL QR code). Naturally, in this case, there are no constraints as to the size of the information, while additional options may be available, such as videos with sign-language interpretation or closed captions, suitable for the deaf and hard of hearing, easy-to-read versions, etc.

Tourist information as well as directional and informational signs for persons with disabilities may all be available in a single sign (see *Figure 47*).

REFERENCES

European Commission (2010). *COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS European Disability Strategy 2010-2020: A Renewed Commitment to a Barrier-Free Europe.* Available on: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52010DC0636 (downloaded: 01.2019)

European Economic and Social Committee (2014). *Opinion of the European Economic and Social Committee on "Accessibility as a human right".* Available on: https://www.eesc.europa.eu/en/our-work/opinions-information-reports/opinions/accessibility-human-right (downloaded: 12.2018)

United Nations, SOLIDERE, ESCWA (2004). *Accessibility for the Disabled - A Design Manual for a Barrier Free Environment.* Available on: https://static.un.org/esa/socdev/enable/designm/index.html (downloaded:12.2018)

United Nations, *Convention on the Rights of Persons with Disabilities.* Available on: https://www.un.org/development/desa/disabilities/convention-on-the-rights-of-persons-with-disabilities.html#Fulltext (downloaded: 12.2018)

Ministry of Regional Development and Public Works, Bulgaria (2009). *Regulation No. 4.* Available on: https://www.mrrb.bg/bg/naredba-4-ot-2009-g-za-proektirane-izpulnenie-i-poddurjane-na-stroejite-v-suotvetstvie-s-iziskvaniyata-za-dostupna-sreda-za-naselenieto-vklyuchitelno-za-horata-s-uvrejdaniya-dv-br-54-ot-2009-g/ (downloaded: 12.2018)

Greek Ministry of Environment and Energy (2017). *Ministerial Decision No. 151344/165, "Drafting of technical specifications for mapping, marking, opening and preserving mountain/hiking trails".* Available on: https://dasarxeio.com/2018/06/05/57387/ (downloaded: 12.2018)

Ministry of Environment and Energy of Greece, former Ministry for the Environment, Physical Planning and Public Works (1997). *Design Guidelines for Autonomous Movement and Living of Persons with Disabilities, Designing for All.* Available on: http://www.ypeka.gr/Default.aspx?tabid=380&language=el-GR (downloaded: 12.2018)

Christofi, Marily (2013). *Accessibility and Disability.* NCDP. Available on: https://www.esamea.gr/publications/books-studies/496-ekpaideytiko-egxeiridio-no-4-prosbasimotita-kai-anapiria-tis-marilys-xristofi (downloaded: 12.2018)

Aragall Francesc – EuCAN (2003). *European Concept for Accessibility.* Available on: http://www.eca.lu/index.php/documents/eucan-documents/14-1996-european-concept-for-accessibility-1996 (downloaded: 12.2018)

Commission de la Capital Nationale – Canada (2010). *Guide des bonnes pratiques pour l'accessibilité aux espaces extérieurs de la Commission de la Capital Nationale.* Available on: https://aapq.org/sites/aapq.org/files/bibliotheque/Best_Practices_Fr.pdf (downloaded: 12.2018)

European Blind Union (2016). *EBU clear print guidelines.* Available on: http://www.euroblind.org/sites/default/files/media/ebu-media/Guidelines-for-producing-clear-print.pdf (downloaded:01.2018)

Forest Service USA (2013*). Forest Service Outdoor Recreation Accessibility Guidelines (FSORAG)*

Forest Service USA (2006). *Forest Service Trail Accessibility Guidelines (FSTAG)*

Gertz Lucy, Weinreb Stu, Scopinich Kris, Clayton Gary, Berrier Jerry, Charlson Kim, et al. (2016). *Mass Audubon's All Persons Trails - A Manual of Guidelines and Best Practices for Developing and Operating Universally Designed Interpreted Trail Experiences. Available on:* https://www.massaudubon.org/get-outdoors/accessibility/accessible-projects-and-partners/accessible-trails-project (downloaded: 12.2018)

Panayotova K. (2012). *ANED 2012 Task 4 - National Accessibility Report.* Available on: http://www.disability-europe.net/countries/bulgaria (downloaded: 12.2018).

RNIB (2015). *Factsheet, Designing gardens and nature trails.* Available on: https://www.rnib.org.uk/information-everyday-living-home-and-leisure-leisure-activities-and-sports/gardening (downloaded: 12.2018)

Shanks Bob, Bird Observers Club of Australia (1998). *Bird-hides and Boardwalks*. Available on: https://birdlife.org.au/images/uploads/education_sheets/INFO-bird-hides-fixed.pdf (downloaded: 12.2018)

Travability Pty Ltd- Parks Victoria (2013). *Park Accessibility Evaluation Manual.* Available on: http://www.keroul.qc.ca/DATA/PRATIQUEDOCUMENT/279_fr.pdf (downloaded: 01.2019)

UNWTO (2013). *Update of the 2005 UNWTO General Assembly Recommendations on "Accessible Tourism for All", taking into consideration the UN Convention on the Rights of Persons with Disabilities of 2007*. Available on: http://cf.cdn.unwto.org/sites/all/files/docpdf/updateofthe2005unwtogeneralassemblyrecommendationsonaccessibletourismforall.pdf (downloaded: 12.2018)

Wiesen Tobias, Eifel National Park (2018). *Fully accessible Eifel National Park.* Available on: https://www.destinationsforall2018.eu/wp-content/uploads/2018/06/Fully-accessible-Eifel-National-Park.pdf (downloaded: 01.2019)

World Health Organization (2001). *International Classification of Functioning, Disability and Health, FINAL DRAFT, Full Version,* WHO/EIP/GPE/CAS/ICIDH-2 FI/ 01.1.

Part Two:
Nature trail accessibility evaluation system

INTRODUCTION

This part of the Guidebook presents techniques and practical tools which can be used when constructing and/or improving accessible nature trails (e.g. within a Natura 2000 site), but they can also support:

- the **trail inspection** process[13] to identify obstacles and issues for various categories of visitors with reduced mobility, e.g. aiming to improve accessibility and experience in general for as many visitors with reduced mobility as possible,
- the **trail accessibility description** process, e.g. aiming to attract, inform and guide visitors with reduced mobility.

Specifically, it presents techniques and tools for the following processes:

a. **Set-up – planning**, i.e. the initial collection of necessary information and details to design and prepare inspections, such as general information on the area's/trail's location, nature, content and management body, the evaluation motive and objectives, any restrictions, etc.

b. **Performing an inspection**, i.e. collecting primary data on the area's/trail's accessibility and use by various types of visitors with reduced mobility, such as measurements and data recorded by inspectors, interviews, photos, etc.

c. **Data analysis – reporting**, i.e. organising and analysing data, and drawing conclusions on obstacles, shortfalls, adversities, risks, etc. of the area/trail for various types of visitors with reduced mobility, as well as presenting aggregate results.

d. **Decision making**, i.e. ranking recorded issues and shaping proposals to address them, as well as compiling integrated work plans and appropriate measures to improve and boost the site's traffic.

e. **Creating useful descriptions for the target groups**, i.e. collecting additional data and information (e.g. additional photos and videos, information on other nearby sites and places of interest, etc.), and producing useful informational material ("accessibility profile") for visitors with reduced mobility, which assists them to become familiar with and appreciate the available options and act/prepare accordingly, before and/or during their visit.

These techniques and tools have been developed so as to:

- constitute a single and complete evaluation system for nature ecotrails and areas,
- facilitate the evaluation of a number of features and factors affecting traffic and experience for various types of visitors with reduced mobility, and not simply evaluate accessibility or compliance with directives and regulations in force,

[13] The techniques and tools presented in this part mostly relate to the inspection of existing trails. Nonetheless, once properly adjusted, they may also facilitate the inspection process for **designing new trails**, aiming to identify on time any accessibility and experience issues relating to visitors with reduced mobility and revise the designs before starting construction.

- be easily applied by inspectors of various backgrounds, without requiring special expertise in or deep knowledge of disability or accessibility issues, or evaluation techniques for people with disabilities, etc.,
- be applied by the personnel of various bodies, in the context of self-evaluation, without requiring representative/real user testing,
- be easy to use, without requiring excessive cost in terms of time, required resources or equipment,
- help identify and promote not only problems, but also positive features that are deemed important in terms of both showcasing them and protecting them, when it comes to forthcoming/future redesigns and additional interventions.

In light of the above, the proposed method may even be applied by one person alone (the "*Inspector*").

Nonetheless, it is recommended that a small team is formed, comprising a minimum of three (3) inspectors, who will work collectively to achieve more objective and reliable outcomes faster (e.g. in five to ten days, depending on the size of the area/trail and the desired depth of the evaluation). In such cases, one person should be appointed *Lead Inspector*.

The inspection process comprises two (2) phases:

- **Set-up** phase
- **Inspection** phase

Afterwards, depending on the objectives of the evaluation, there are two (2) additional phases:

- **Data analysis – Decision making – Reporting** phase
- **Documentation** phase

A. SET-UP

All preparatory tasks for the application of the proposed evaluation system relate to collecting and recording information on the objectives, context and scope of the evaluation, placing particular emphasis on meticulously recording each individual feature of the area/trail to be inspected. The following initialisation forms have been drafted to assist in information collection:

- Form A1. Evaluation background
- Form A2. Inspector's personal profile
- Form A3. Inspection team profile
- Form A4. Information on the area/trail

First, fill in **Form A1** with all key evaluation features, such as the name of the area/trail under evaluation, the evaluation performance period, objectives and type of expected outcomes, the body in charge of managing the area/trail, the body on behalf of which the evaluation is conducted, the body performing the inspection, etc. Then, each member of the inspection team uses **Form A2**[14] as a questionnaire to illustrate their professional expertise and how familiar they are with the area/trail under evaluation, the evaluation techniques and concepts, the languages used in the environment, etc. This personal information is then summarised in **Form A3**, to be used later in the documentation phase. The next step in set-up is to describe and mark the boundaries of the area/trail under evaluation (i.e. of the evaluation object) by filling in **Form A4**. Particular emphasis should be placed on recording all individual features of the area/trail under evaluation that need to be inspected, so as to ensure a comprehensive evaluation.

Once all information is collected using Forms A1-A4, the following steps should be taken before the next phase commences:

- Prepare (e.g. produce the individual copies and fill in the introductory sections) the necessary **Checklists B1-B10** (see following section) and then reproduce them (e.g. print them out) and distribute them to the inspectors.
- Assign roles and tasks, in case of an inspection team (e.g. select starting points, define responsibility zones, when there is a vast area requiring to be divided, etc.).
- Inform and train, wherever required, all inspectors, to ensure that they know and understand how to perform an inspection and how to fill in each checklist, as well as how/where to submit the completed checklists.
- Provide the inspectors with appropriate tools and means for the required measurements (i.e. maps, both small and large scale, e.g. 1:5000, 1:500, 1:200, cameras and/or video cameras, measuring instruments) and train them accordingly in measurement techniques.

[14] **Note**: When one person performs the inspection, **Form A2** is not required.

B. PERFORMING AN INSPECTION

Inspections are mostly performed using the checklists to monitor compliance with the technical specifications, instructions, standards, good practices etc. included in **Part One** of this Guidebook. Specifically, each inspector (along with any assistants), following the instructions of the checklists, should walk through the area/trail, carefully inspecting the various features based on the *checkpoints* included in the checklists.

Note: Problems usually arise in four ways:

a. a single spot (e.g. non-compliant with specifications),
b. two or more spots that need to be compared to identify the problem,
c. a problem relating to the overall structure/flow,
d. omission of something that should have been included (***Note:*** *this refers to situations that are difficult to identify and require increased attention and thoroughness*).

This is why it is recommended to go through each feature (path, building, activities area, etc.) at least three (3) times (completing the respective checklists each time):

- The first time, they get an overview of the area/trail and the options and features included.
- The second time, they can focus on individual features/spots, step-by-step.
- The third time, they can search for any issues that were not identified during the previous walkthroughs (e.g. coherence issues, updating issues, any omissions, etc.).

The following checklists have been prepared and must be used, depending on the details completed in **Form A4** during initialisation:

- Checklist B1. Competent body (BOD)
- Checklist B2. Entrance/Exit (ENT)
- Checklist B3. Path (PTH)
- Checklist B4. Crossroad (CRO)
- Checklist B5. Infrastructure-Buildings (BLD)
- Checklist B6. Activities area (ACT)
- Checklist B7. Services (SRV)
- Checklist B8. Information/Service media (MED)
- Checklist B9. Equipment-facilities (EQP)
- Checklist B10. Signage (SGN)

In general, it is recommended to perform the inspections in the following order:

- competent body (BOD),
- entrance/exit (ENT),
- paths (PTH), one after the other, thoroughly and in the following order: clear width and height, surface slope, any protruding obstacles, any rest and manoeuvring areas and narrow

intersections, usable surface, signage (SGN), any equipment (EQP) and media (MED), any buildings (BLD) and activities areas (ACT), crossroads (CRO),

- services (SRV).

In general, inspectors are not required to know/remember particular specifications for individual features, since these are included in the checklist questions. Nonetheless, it is advisable for inspectors to be familiar with the "**Introduction**" and "**Part One**" of this Guidebook to easily refer to it (e.g. to charts, etc.) during inspection, when appropriate.

B1 Techniques and measurement instruments/tools for the purposes of inspections

To complete the various inspections included in the "Nature trail accessibility evaluation system", the inspector needs to perform certain measurements at various stages. Measurements are indicated with in the checklists. There are various available ways, techniques and instruments[15] to choose from. A few practical, low-cost solutions are presented below.

It is also recommended to take many on-the-spot photos during inspection. These will allow to correctly evaluate the circumstances recorded in the checklists, when completing the evaluation at the office. The icon appears in checklists, when it is deemed useful for the inspector to take photos[16].

B1.1 Evaluating stability of usable, stop and manoeuvring surface

To evaluate whether a surface is stable and firm, the following two questions should be answered affirmatively:

- Is it possible for a person riding a bicycle with normal/narrow tyres[17] to ride across the surface without making imprints?
- Is it possible to easily guide (push/turn) a folding stroller[18] containing a small child without making imprints?

***Note**: This method is not scientifically accurate, yet it has proven to be efficient.*

[15] E.g. It is recommended to read the guide published by visitbritain: "How to take accurate measurements for your Accessibility Guide". Available at: https://www.accessibilityguides.org/sites/default/files/pictures/How-to-take-accurate-measurements-for-your-accessibility-guide3.pdf

[16] It is recommended to read the relevant guide published by visitbritain: "Photography Guide". Available at: https://www.accessibilityguides.org/sites/default/files/pictures/PhotographyGuideEditionTwo%20.pdf

[17] Bicycle tyres are similar to the large rear wheels of a wheelchair.

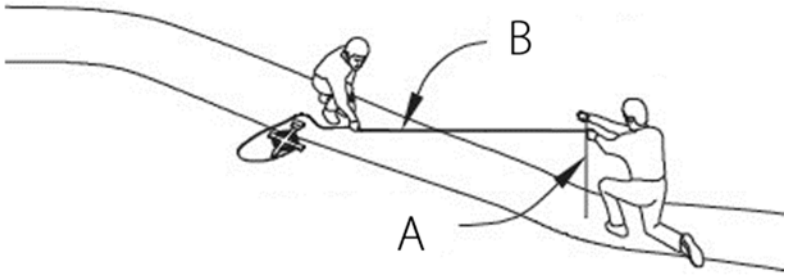
[18] Stroller wheels are similar to the front wheels of a wheelchair.

B1.2 Measuring dimensions and distances

When measuring the dimensions of various features or small distances, it is recommended to use a 5-m steel measuring tape and at least a 30-m survey tape. These are readily available in the market (e.g. for €10-15). Also, for convenience purposes, you can get a laser distance metre, e.g. 80 m, which can also measure angles and slopes.

B1.3 Calculating heights and slopes

The slope of an inclined surface is often defined based on the ratio of the vertical distance to the horizontal distance (i.e. change in elevation). For example, a slope of 1:20 means that for every 20 m of horizontal distance there is a movement of 1 m in height. Slopes may also be expressed as percentages. For example, a slope of 1:20 translates into 5%, which is calculated as follows: $(1 \div 20) \times 100\%$. Sometimes, slopes are expressed as angles, based on the angle of the inclined surface to the horizon. For example, a slope of 1:20 is equivalent to an angle of less than 3°. Once vertical distance *"A"* and horizontal distance *"B"* have been measured, it is easy to calculate the angle, either by using the available tools[19] or the *trigonometric tables*, searching the angle with a tangent of $A \div B$.



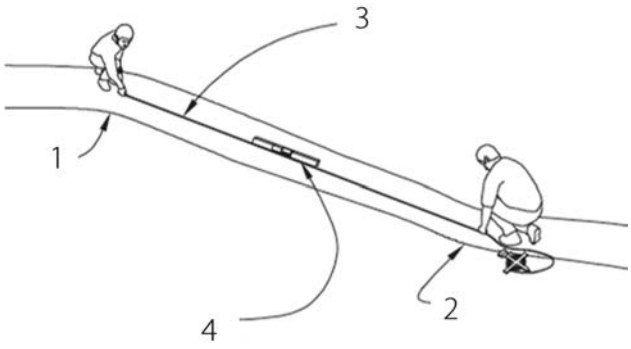
(A) = vertical distance
(B) = horizontal distance
(C) = A ÷ B
Slope ratio = 1:C
Slope percentage = C × 100%

Figure 48. Calculating slopes using measuring tapes/rods
Adapted from: United States Department of Agriculture (2012)

Such measurements may be performed using a steel measuring tape or a survey tape. Nonetheless, it is recommended to measure distance "A" using measuring rods for higher accuracy. In the market, you can also find professional telescopic measuring rods, e.g. 5 m, which have an incorporated level. For small distances with fixed slope (e.g. constructed ramps), clinometers, which are available for €5-10, and digital levels, directly calculating angles in degrees, are particularly handy.

Figure 49. Clinometer

[19] E.g. https://www.calculator.net/triangle-calculator.html



(1) = grade break start

(2) = grade break finish

(3) = survey tape

(4) = clinometer or digital level displaying slope

Figure 50. Calculating a slope using a clinometer or a digital level
Adapted from: United States Department of Agriculture (2012)

B1.4 Inspecting for limited visual field

As mentioned in "**Part One**" of this Guidebook, it is important to check whether the various features in the environment are placed in spots that are easily detectable by visitors, evaluating if they are within a visitor's visual field or are placed, for example, in the opposite direction.

When it comes to checking visibility of various features (e.g. signage) for persons with limited vision (see paragraph *A2.3a Visual field*, page 37), it is recommended to use a simple construction, which is easy to build using cardboard (or plastic) and thread (or coloured fishing line), in the dimensions shown below, and which simulates a limited visual field extending up to 30° superiorly, 70° inferiorly, and 45° towards the right and the left.

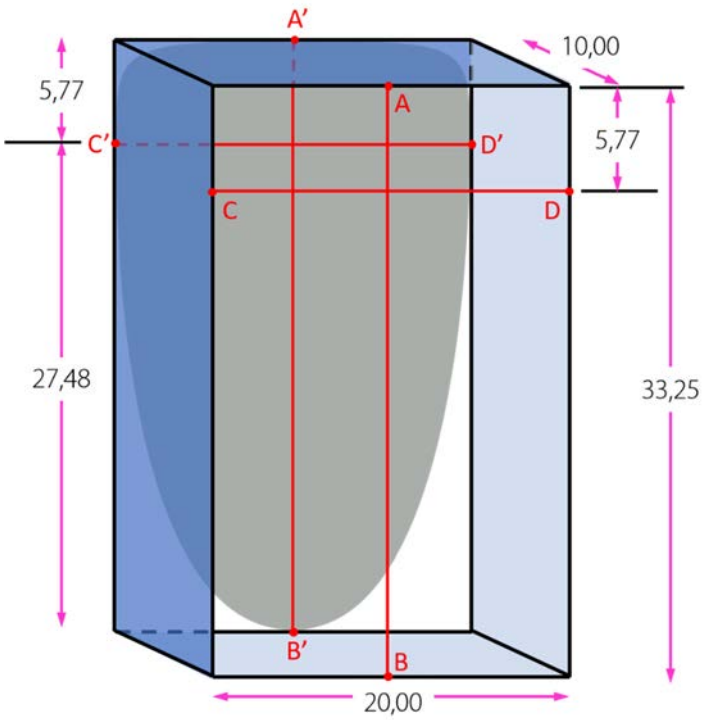


Figure 51. Special construction simulating a limited visual field (in cm)
(Cardboard parts are shown in blue, while threads are shown in red).

Looking through this construction and using the front threads to focus on C-D thread height, forehead and nose constantly touching A-B thread, and using the cross-section of the A-B and C-D threads to orientate yourself towards the direction a visitor would normally look, check whether the construction hinders you from seeing any significant features, as would happen to people with limited visual field, either due to total impairment in one eye or partial impairment in both eyes.

B1.5 Inspecting colours and contrast

Inspection of colours and contrast of man-made features (e.g. colour contrast among a building's structural elements, such as door surface and door frame or wall, or on signs, inscriptions, etc.) can be roughly performed by photographing the feature under inspection in normal and lower light levels (e.g. when cloudy or at dusk) and then:

a. printing out the photo in black and white and checking for any missing information (as would happen for colour blind persons),
b. using the available simulators[20] to check the photo for missing information under various types of colour-blindness and/or
c. using the available tools[21] to calculate the contrast ratio between various areas of the photo.

Alternatively, and more accurately, provided that the colours used (e.g. for a sign) are already known in RGB or 16-bit format, etc., it is easy to directly calculate the contrast ratio (without a photo) using the corresponding tools[22], which are also available.

B2 Supplementary inspections

In general, on top of the inspections using the B1-B10 checklists, it is recommended to also perform the following inspections, when feasible.

B2.1 Inspections using the cognitive walkthrough technique

The *cognitive walkthrough* technique applies mostly to cases when self-explanatory use is sought, that is the option of directly using something without having to get informed or read manuals and guidebooks beforehand (learn through use). Inspections using this technique focus on evaluating whether something is easy to use for new or non-recurring visitors. They apply mostly to matching the user's objectives to the environment's features when completing normal-use scenarios.

[20] E.g. https://www.color-blindness.com/coblis-color-blindness-simulator/

[21] E.g. https://www.oss-usa.com/color-check-ada-image-compliance

[22] E.g. https://webaim.org/resources/contrastchecker/, https://contrast-finder.tanaguru.com and https://axesslab.com/top-color-contrast-checkers/

Specifically, when applying this technique, the evaluator performs the following tasks:

- defines normal users,
- defines normal activities/use scenarios,
- defines the correct/desired action sequence a user should follow to meet their objectives,
- for each step in the sequence (i.e. for all steps of interaction), conclude whether the user will be able to successfully complete the current action and move on to the next one, based on the following criteria/questions:
    - E1: Can the user identify the next correct action to achieve their objective? *(i.e. Is the next correct action perceptible and clear, self-evident and/or obvious to the user?)*
    - E2: Does the user understand and is able to perform the correct action? *(i.e. Do they understand and are they able to perform all required steps to complete the action>)*
    - E3: Is the user aware of making the correct or wrong choice? *(e.g. Can they promptly/timely confirm that they have made no mistakes and have no doubts?)*

This method reveals design imperfections, based on the points for which questions E1-E3 are answered negatively, so as to take appropriate measures to restore them.

In practice, to perform a walkthrough, the inspector should perform each and every use/visit scenario and review each step in the user's action sequence, posing the following questions (taking into account all possible use circumstances):

- Will the user be able to understand which steps may lead them to achieving their objective? Is it possible that the user may not understand that a certain option/function is required to achieve their objective? Is it possible that they would expect a different option/function to be available?
- Can the user see that the correct option/function is indeed available? E.g. Is there any helpful signage? Could the existing signage confuse the user?
- Will the user be able to understand which action they are required to take? E.g. Is it possible that an accessible option is obvious, yet the user does not understand that it is appropriate for them?
- Once the user has completed an action, do they receive the necessary feedback? Can the user immediately recognise they have made a correct choice?

All these checkpoints/questions should be further tailored depending on the type of man-made intervention, e.g. path, building, service, etc. For example, "Once a new, non-recurring, user enters the area (that is through an entry/exit point) are all necessary services available to and perceptible by them?", "Are there accessible signs rendering the available options visible to / perceptible by the user?", "Are the signs available to, visible to and perceptible by the user when they need them the most?", "Are all dead-ends clearly marked?", etc.

B2.2 User/Visitor satisfaction survey

Measuring user/visitor satisfaction does not have to be complicated or expensive. Actually, it is quite simple to incorporate the process of measuring satisfaction of the applied strategy for assisting visitors with reduced mobility, by collecting feedback through visitor surveys asking about their experience.

There are many ways to conduct a survey in terms of design, scheduling, sampling and even data analysis. Regardless of the selected approach, there are certain fundamental actions to be taken to ensure effectiveness and credibility:

- Define the goals of the survey.
- Design the survey plan.
- Select a survey type (simple, multiple indicators, etc.).
- Design the questions.
- Determine participation incentives.
- Select the survey media (printed questionnaires, short questions, face-to-face interviews, etc.) and ensure accessibility for all.
- Conduct the survey and collect/analyse the data.
- Apply corrective measures and repeat.

On top of the standard questionnaire-based subjective satisfaction surveys, you can also find out the visitors' opinion by analysing any complaints, provided that there is such a process in place (recommended).

B2.3 User/Visitor experience study

The user experience study examines whether crucial quality features, such as perceivability, understandability, approachability, accessibility, usability, safety and autonomy (see definition in *Introduction*, section A, p. 13 of this Guidebook) are being compromised for any target-group throughout the visit (before, during and after the visit).

Such an evaluation is only feasible at the end, once evaluation based on checklists, walkthroughs and user satisfaction surveys has been concluded.

C. DATA ANALYSIS – DECISION MAKING – REPORTING

Following on-site inspections, it is required to collect the completed checklists and organise them in folders along with any photos, etc. If necessary, they should be rewritten in single checklists and then be reviewed one-by-one in terms of completeness and validity (e.g. assisted by the photos). Any ambiguities and doubts should be further investigated through on-site visits/inspections.

To evaluate the findings, one should review (and collect in a short list) all answers in checklists B1-B10 bearing the "×" mark, which indicates an error in terms of compliance with the Guidebook's specifications.

- When this list contains errors in general questions (i.e. in questions that do not bear any of these icons  and do not refer to a specific category of visitors with reduced mobility), then it is deemed that the area/trail is not fully in compliance with the needs of visitors with reduced mobility, affecting a larger pool of this target-group.
- Accordingly, if errors relate to a specific category of visitors with reduced mobility, then it is deemed that the area/trail may present major obstacles/issues for said category of visitors.

In all events, the aggregate list of errors should be further reviewed to assess the significance/importance of each error, taking into account three variables:

- Frequency (e.g. "Is this a frequent or rare issue?")
- Impact (e.g. "Will it make it harder for or completely hinder the user?", "Will it endanger the user's health/safety?", "Will it be easy or difficult for users to deal with it?")
- Persistence (e.g. "Is it a problem that occurs once and the users are able to overcome it once they are aware of it or are the users repeatedly hindered and have to address it each time?")

Once the significance of the errors has been assessed, they can be ranked accordingly. This way, it is possible to inform the public, but also schedule specific actions to resolve problems. At this stage, it is possible to also review solutions/proposals for resolving each error and/or further preventive measures, and to rank errors again based on both their significance and on whether it is possible/reasonable to implement the required improvements.

On top of the aggregate error list, it is recommended to compile an aggregate list of good practices, i.e. of all the points that were compliant based on answers bearing a "👍" or "👍👍" mark, so as to properly showcase those when promoting/advertising/informing the public. Such a list may also be organised in separate sections: general, good practices for persons using wheelchairs, good practices for persons with impaired vision, etc.

D. DOCUMENTATION

D1 Evaluation report

Once the inspections and data analysis are completed, it is important to draft a final report to present the findings, in short and in detail, using examples and photos. The final report should cover at least the following sections:

- Introduction
    - Purpose and scope of the evaluation (see Form A1)
    - Team performing the inspection (see Form A3)
- Section 1: Presentation/Description of the area/trail
    - Objectives, major features of interest, etc. (see Form A1)
    - Target-visitors (see Form A1 and A4)
    - Features of the area/trail, photos, maps, etc. (see Form A4)
- Section 2: Review findings relating to compliance with the Guidebook's specifications, good practices etc. (see Checklists B1-B10)
- Section 3: Findings from any supplementary inspections
    - Findings from cognitive walkthroughs
    - Findings from visitor surveys
    - etc.
- Section 4: Aggregate presentation and ranking of the evaluation findings (ranking based on error importance)
    - Per type (paths, buildings, activities, media, etc.)
    - Per category of visitors with reduced mobility
- Section 5: Proposals to restore, improve and prevent (with reference to the specific error resolved/addressed)
- Conclusion (i.e. conclusions and any lessons learned, e.g. for future inspections in this or other areas)

This report, depending also on the evaluation goals (whether this is a formative or summative report) may be presented and used to make strategic decisions for next steps and future goals of promoting and making the best use of the ecotrail for the public.

In all cases, on top and following such a report, which is drafted for internal purposes, it is also recommended to:

a. draft and disclose an *"accessibility statement"* relating to the entire area/trail, and
b. form and release to the public an *"accessibility profile"* for the area/trail.

D2 Accessibility statement

Once the accessibility of an area/trail has been evaluated and documented, it is recommended that the managing body issues and regularly updates (e.g. annually) a detailed, comprehensive and clear accessibility statement, in compliance with the specifications of this Guidebook. Such an accessibility statement should be provided in accessible formats and be readily available to interested parties. For example, it should be posted on the respective body's website and at the main entry points to the area/trail.

The accessibility statement should include the following:

a. the evaluation method which was applied and whether the body or a third party performed the evaluation,
b. any places (paths, infrastructure, etc.) that are not accessible and perhaps accessible alternatives,
c. description (or link to an online or phone mechanism) of the process for informing and submitting feedback, through which each person can inform the body on any shortfalls relating to accessibility requirements and ask for any missing information,
d. information on contacting the body in case of emergency, non-satisfactory response, for more information, etc.

D2.1 Accessibility statement template

An accessibility statement template is available below. Text in square brackets and italics should be deleted and/or amended, where appropriate.

ACCESSIBILITY STATEMENT

[*Body's name*] commits to render the [*area/trail*] accessible, in compliance with the guidelines for visitors with disabilities that are included in the "Guidebook for Accessible Nature Trails – Design Guidelines and Evaluation System" (source: *[URL for the Guidebook]*).

Compliance status

This *[area/trail]* is in **full** compliance with the general guidelines relating to visitors with reduced mobility provided in the aforementioned Guidebook.

or

This *[area/trail]* is **partly** in compliance with the general guidelines relating to visitors with reduced mobility provided in the aforementioned Guidebook, as a result of the following: *[cases of non-compliance].*

and (provided it applies)

*[Also, this area/trail is] [**fully/partly**] [in compliance with the special guidelines of the aforementioned Guidelines relating to] [visitors using wheelchairs] [visitors with walking difficulties] [visitors with vision impairment] [visitors with hearing impairment] [visitors with intellectual, cognitive or mental disabilities] [as a result of the following:] [cases of non-compliance].*

Preparing this accessibility statement

This statement was drafted on [*date*], following an evaluation performed by [*body's name or name of the third party that performed the evaluation*], based on a regular inspection to verify compliance with the guidelines provided in the Guidebook [*as well as following supplementary inspections and data collection through cognitive walkthroughs / visitor satisfaction surveys, etc.*].

[The statement was revised on] [enter the date of the most recent revision, if applicable].

Submitting feedback and contact details

[Describe the process for submitting feedback – mentioning any link to relevant mechanisms – so the body gets informed of non-compliant cases and visitors may submit information and requests for content outside the scope of the Guidebook].

[Enter the contact details for the entities / management units / persons that are responsible for accessibility issues and for processing requests submitted through the process for submitting feedback].

D2.2 Additional content

The following content could also be included in the accessibility statement, where appropriate:

- A description of the body's commitment to accessibility, for example:
    - the body's intention to achieve a higher level of accessibility than the one described in the Guidebook,
    - any corrective measures to address incidents of non-compliance, as well as the timetable for the implementation of such measures.
- The official approval (e.g. at management level) of the accessibility statement.
- The seasons/period when the area/trail is open to the public and the aforementioned compliance level is ensured.
- A link to the respective evaluation report, provided this is available, especially if the report includes a full compliance status.
- Any information on additional phone support for people with disabilities and on support to visitors with reduced mobility.
- Any other useful information.

D3 Accessibility information/profile

This section includes some practical advice for the bodies to improve their ability of raising awareness, informing and updating as many interested parties as possible on the accessibility of their ecotrails, and providing documentation and valid data that have been collected as a result of the regular inspections performed based on this Guidebook.

According to recent surveys, many visitors with reduced mobility are likely to return to an area with good accessibility. This means that these visitors place great emphasis on confirmed accessibility. Therefore, each body should consider the ways in which it can inform and persuade the public of the accessibility of its infrastructure. Actually, over 95% of persons with disabilities search for information about accessibility before deciding to visit an area. It becomes apparent that the manner of promoting a destination's accessibility is crucial in attracting and increasing the number of visitors with disabilities.

What is important and should be taken into consideration is that interested parties usually trust two sources when it comes to a destination's accessibility:

a. **word-of-mouth**, i.e. information from relatives, friends and acquaintances (e.g. a friend who recently visited the area, other members of an association, etc.),

b. **online information** (e.g. comments on social media, official information on the body's website, independent body inspections, awards, etc.).

It should be noted that interested parties are often cautious of information provided by the body, as for many years such information was extremely general, vague and misleading, mostly due to the providers' limited understanding of issues relating to disabilities.

Therefore, in the context of a systematic marketing strategy for an ecotrail for persons with reduced mobility, agencies should:

- Provide the necessary information about the accessibility of the ecotrail in a simple, comprehensive and valid manner. For example, it is important to have a trail inspected in cooperation with representatives and/or have the findings accepted/verified by an independent body (e.g. the local association of persons with disabilities). The manner in which such information is presented (*Is it clear and easy to understand? Are there are any maps, detailed reports, etc.?*), whether it addresses actual needs/questions of the interested parties (*Does it allow the interested party to assess whether accessibility levels are suitable for them? Is it easy for the user to identify the information that relates to them?*), the means used to disclose the information (*Are the means and information accessible by all interested parties?*) and the credibility of the source (*Is the information real? How was it collected? Who has signed off on the information?*) **are crucial factors** for accepting and sharing the available information.
- Invest in *social media marketing* to spread accessibility information and mostly to create opportunities for satisfied visitors to share their personal experience (e.g. providing links on social media to "like" the ecotrail they visited, etc.).

D3a. Ecotrail accessibility profile

The accessibility profile of an ecotrail is a set of information providing details about the accessibility of the trail. This information should be documented (e.g. following a regular inspection as the one described in this Guidebook), be written in simple language and not include any vague statements or generalities, such as "this is an accessible trail", when, for example, this does not apply to all groups or to all types of wheelchairs, etc.

It is recommended to provide both a brief[23] and a detailed version of the accessibility profile, in various accessible formats and through various means, such as online (e.g. on the body's official website), hard copy (e.g. an Accessibility Guidebook[24]), signage (e.g. at points of entry), videos, etc. or any combination thereof.

This is an example for the structure of an accessibility profile[25] so that it comprises a single and comprehensive source of information for interested parties.

- **Who we are**
    - **A few words about the area/trail** [mentioning features of interest for most visitors and special groups, as well as information on the wider area]
    - **What our visitors say** [excerpts from actual visitors' opinions, any awards, etc.]
    - **Our body** [information on the body's structure, tasks, financing and features enhancing its credibility, the information and the accessibility statement]
    - **Accessibility statement** [see above]
- **When to visit** [opening hours, temperatures and weather conditions per season, advantages/disadvantages per season, etc.]
- **How to get here** [display the location of the area on the map, information for people travelling from far away, modes of transport to and from the area, location of major entry/exit points, accessibility conditions at entry/exit points and in the modes of transport, etc.]
- **What to see and do during your visit**
    - **Suitable paths** [information on accessibility and photos of the trails, signage, equipment, etc., and information on the major points of interest, attaching maps, detailed reports and special remarks by actual visitors, etc.]
    - **Activities and facilities** [mentioning services and activities areas within the site, information on their accessibility and information on any facilities]

[23] Example of a brief accessibility presentation for the Royal Botanic Garden in Edinburgh: https://www.euansguide.com/venues/royal-botanic-garden-edinburgh-351/information#page-content

[24] E.g. Visitbritain provides guidelines and tools for creating accessibility guides: https://www.visitbritain.org/business-advice/make-your-business-accessible/create-accessibility-guide

[25] Statement example by the Royal Botanic Garden in Edinburgh https://www.rbge.org.uk/media/6036/access-statement-edin-2019.pdf.

- **What you need to know** [mentioning any issues or obstacles that certain visitor categories may encounter, the locations where issues arise, any dangers and advice/guidelines for emergencies and/or any relative procedures.]
- **How to prepare** [practical advice on clothing, equipment, supplies, etc., but also on available material to print and bring along, e.g. maps, printed trail directions, etc.]
- **Do you have any problems or require additional information?** [information on contact persons for interested parties to contact before, during or after their visit, to ask for more information, help, etc.]

Especially when presenting paths and showcasing their accessibility, the following supplementary mediums are quite useful and convincing, and they support a well-structured accessibility profile:

- **Well-structured photo albums**, promoting accessibility conditions, participation in activities, etc.
- **Professional and/or amateur videos**, e.g. complete videos of each path (e.g. taken by drones and/or 360° views)
- **Special maps and charts for each path/infrastructure,** for example:
    - **Constructed maps showing the path**, e.g. aerial photos using different colours to indicate parts that are suitable for all categories of visitors with reduced mobility, accessible points of interest, viewing areas, activity areas etc., facilities, such as accessible restrooms, parking spaces, access to water, information, etc.
    - **Descriptive navigation directions for each path/trail**, indicating distances, slopes, places of interest, points to change course, clearly guiding the visitor through locations that may confuse him.
    - **Constructed elevation and/or difficulty charts for the paths**, indicating distances, differences in slope, clear width, surface material, slopes, locations requiring attention/help from a third party, bridges, etc. Elevation charts provide important information for many visitor groups and have proven to be quite useful, while preparing them is not that hard. For example, the Google maps application provides for free the option of constructing an *elevation profile*, using information on height differences for whichever trail you may choose, at any area[26]. It is recommended, though, to further process them, adding slopes, obstacles etc., as mentioned earlier.
    - **Charts, 3D models, photos, etc.** of information kiosks, observation decks, shelters, activities areas, such as picnic area, camping area, etc.
- **Audio and/or videos with interviews from actual users**
- **Social media feeds**

[26] See https://support.google.com/earth/answer/148134?hl=en. See how in the following video: https://www.youtube.com/watch?v=TZZ-dKOp8NY.

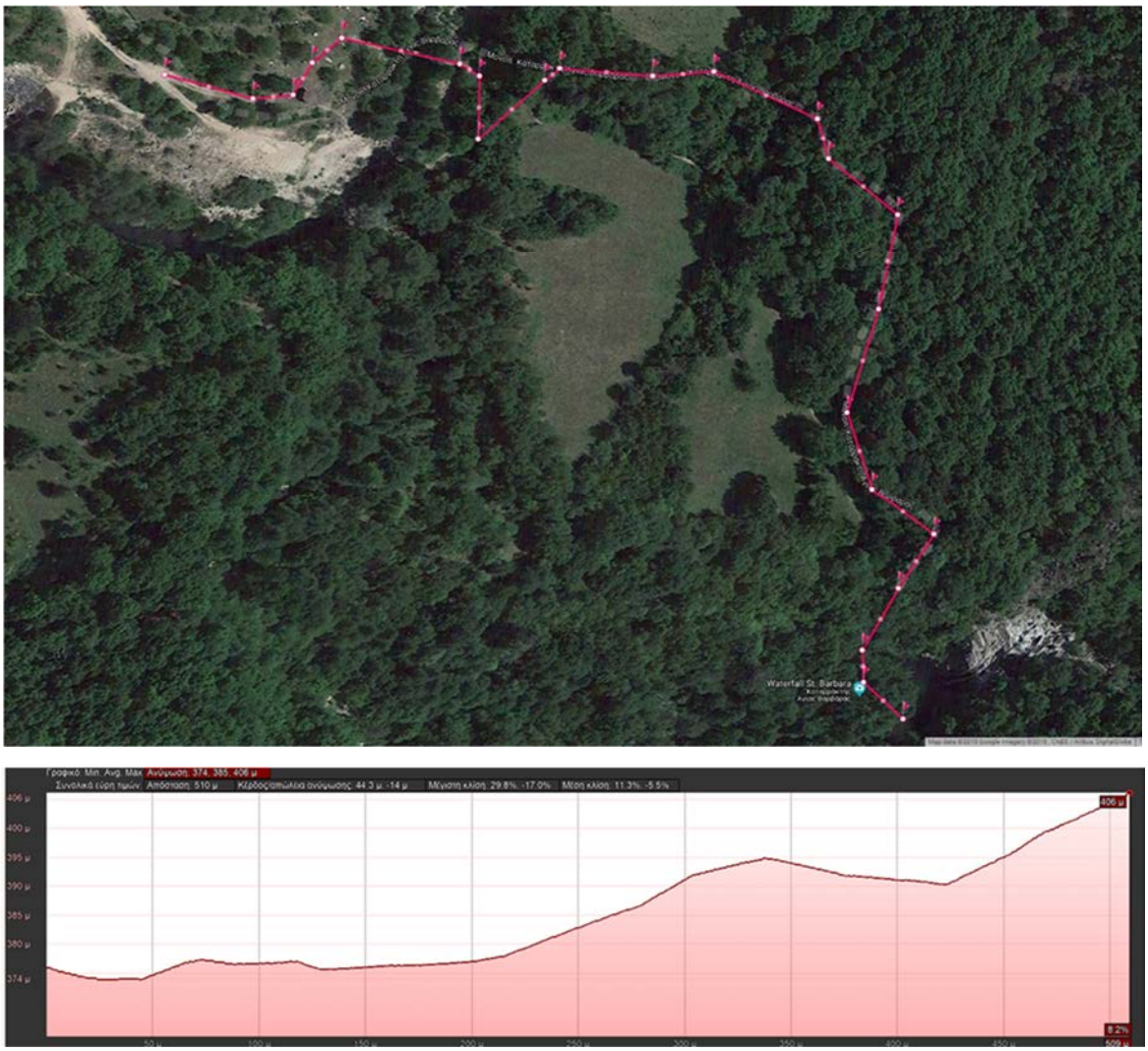


Figure 52. Example of constructing a path map using Google maps: marking distances and points to change course (above) and elevation chart (below)

REFERENCES / BIBLIOGRAPHY

Ministry of the Interior – Greece (2009). *Accessibility methodology applied by public services and infrastructure.* Available at https://docplayer.gr/2808479-Methodologia-eleghoy-prosvasimotitas-dimosion-ypiresion-kai-ypodomon.html (downloaded: 01.2019)

Accessible Arts (2012). *Accessibility Resource Kit – Venue Checklist: Exhibition Checklist.* Available at *http://www.aarts.net.au/resources/* (downloaded: 01.2019)

United States Department of Agriculture, Forest Services (2012). *Accessibility Guidebook for outdoor recreation and trails*. Available at https://www.americantrails.org/resources/accessibility-guidebook-for-outdoor-recreation-and-trails (downloaded: 01.2019)