Accessible Design Standard

ACCESSIBILITY
CLUSTER REQUIREMENTS
DESIGN SOLUTIONS
THIRD-PARTY INTEGRATIONS

Accessibility

Universal accessibility is a major concern in developed countries, especially in the contest of Smart Cities. However, there is considerable confusion about the meaning of this concept. The definition varies from one author to another, and none covers all dimensions identified by all the texts. There are also many proposals, more or less articulated, of different types of design for its achievement.

ROCQUE, S., LANGEVIN, J., CHALGHOUMI, H. AND GORAYEB, A., *Universal Accessibility*

Based on an analysis of the literature and practice, Roque proposes a formal definition that is consistent with the axiological dimension of universal accessibility and can lead to an objective assessment "accessibility is the nature of a product, process, service, environment or means of access to information which, in an inclusive view, allows all users, including those that may have (or experience) limitations, to obtain by themselves equivalent results in activities."

Inclusive design, universal design and design for all are terms used to describe an approach of developing products, services and environments, which are usable and attractive for a large number of people regardless of age, gender, language and ability.

BECHMANN, S., *Inclusive Design, a Perfect Solution?*

The aim of inclusive design is to meet the needs of the largest possible number of potential users. Among the target population, inclusive design is particularly interested in users who are likely to have or experience limitations.

The first stage of inclusive design is to identify all potential users, their characteristics and needs. It should also identify the specific factors of obstacle in regard to motor skills, or sensory or cognitive requested. In this context, a strategy of inclusive design may involve designing a product taking into account reference groups composed of users with specific characteristics. For example, people in wheelchairs can provide a reference group for inclusive design in relation to the motor dimension of universal accessibility.

As Bechman points out, inclusive design is also relevant because anyone can potentially benefit from this: some people may temporarily belong to some disabled groups, by for example be carrying heavy luggage or pregnancy, or they may just benefit from a more accessible design.

The UK Commission for Architecture and the Built Environment gives following advice to developers of public places: "As an obvious first step, avoid steps. Replace them with a gentle incline between floors". By replacing stairs with gentle inclines the walking distance increases dramatically: the solution will benefit wheelchair users but exclude those who have problems with inclines and distances. Here, The UK Commission for Architecture and the Built Environment automatically jumps to a conclusion and gives a solution, instead of encouraging insight in diverse disabilities of lead users.
This example clarifies that when it comes to inclusive design, there is no standard solution. Each case needs to be evaluated and solved accordingly.

UK COMMISSION FOR ARCHITECTURE AND THE BUILT ENVIRONMENT, *The principles of inclusive design*, (2006)

Traditionally, the terms "handicapped" or "disabled" referred to the loss, damage or deviation in psychological, physiological or biological functions. Disability was seen as a property of the individual; that is, the handicapped or disabled person. Within disability research, there has been a development from

a disease and individualoriented understanding of disability, to a social model. In the social model, the lack of rights and lack of access to different areas of society create disability. In this model, disability is not a constant factor, but rather something that may occur in an individual's meeting with society.

PATHAKJI, N., *A Reflexive Law Approach and Accessibility Rights of Persons with Disabilities to the Virtual World: Seeking the Midas Touch of Corporations*, (2015).

The growing dissatisfaction with the medical model of disability led to the search for alternative conceptualisations of disability, which gave rise to the social model. According to the social model, it is the physically engineered environment, and the attitudes that are reflected in its construction, that play a central role in creating the condition termed 'disability'. It asserts that impairment alone is not disabling. It is society which creates disabilities by isolating, excluding, and stigmatising people who have physical or mental impairments. Since disabilities are caused by the socially constructed environment, it is society's ethical or moral duty to change that environment to provide equal access and equal functioning to all its members

FUGLERUD, S. K., *Inclusive design of ICT: The challenge of diversity*, (2014). PhD dissertation.

Cluster Requirements

	Urban Space	Internal Space	Interface	Map
Deaf (also hearing impairment, communication impairments)	people with communication impairments will avoid asking for directions: on street information must be consistent avoid routes that share surface with vehicles proper lighting and space	proper lighting and space	interface must not be reliant on voice recognition or other voice commands visual alternatives to sounds (e.g. transcript and closed captions for videos) most of deaf people can't read: visual alternative to captions	none
Wheelchair user	avoid stairs, narrow pavements and surfaces shared with vehicles manoeuvring space wheelchair users need to know where to find adapted facilities (e.g. toilets)	avoid stairs and narrow doorways/corridors manoeuvring space wheelchair users need to know where to find adapted facilities (e.g. elevators, toilets, etc)	paralysed people may not be able to use a pointing device: ensure that the interface is keyboard accessible	none
Ambulant disabled people	avoid steep gradients and routes that lack of stepped access ambulant disabled people need to know where to find seats avoid long distances with no resting places	avoid steep gradients and routes that lack of stepped access ambulant disabled people need to know where to find seats and elevators	none	none
Colour blindness	Avoid colour to convey information	avoid colour to convey information	avoid colour to convey information avoid red+green combination	avoid colour to convey information avoid red+green combination
Epilepsy	none	none	avoid anything that flashes more than three times per second	none

	Urban Space	Internal Space	Interface	Map
Vision impairment	blind p./p. with vision impairment need to know how to move and where to find pedestrian an crossing, bus stops, and other facilities. avoid routes that share surface with vehicles obstacles should be clearly identifiable. New obstacles should be reported (e.g traffic report by users on Waze)	blind p./p. with vision impairment need to know how to move inside a building (e.g. where to find elevators, stairs, toilet, routes)	ensure that the interface is screen reader accessible avoid unnecessary sounds (e.g. music on load) vision impaired people may not be able to use a pointing device: ensure that the interface is keyboard accessible users might want to set their own preferences of style, size, colour and background colour	enlarge map (any element: map, labels, text, legend)
Autism	on street information must be consistent	none	logical, consistent layout avoid any distracting element (e.g. music on load) enable content that moves, scroll or blink to be paused, stopped or hidden information must be presented in clear and simple language (e.g. use plain language, make buttons descriptive, avoid figures of speech)	none

Design Solutions

TEXT DESCRIPTION

- Provide a long description of the map in text or HTML.
- Provide an ALT attribute for image-based maps.

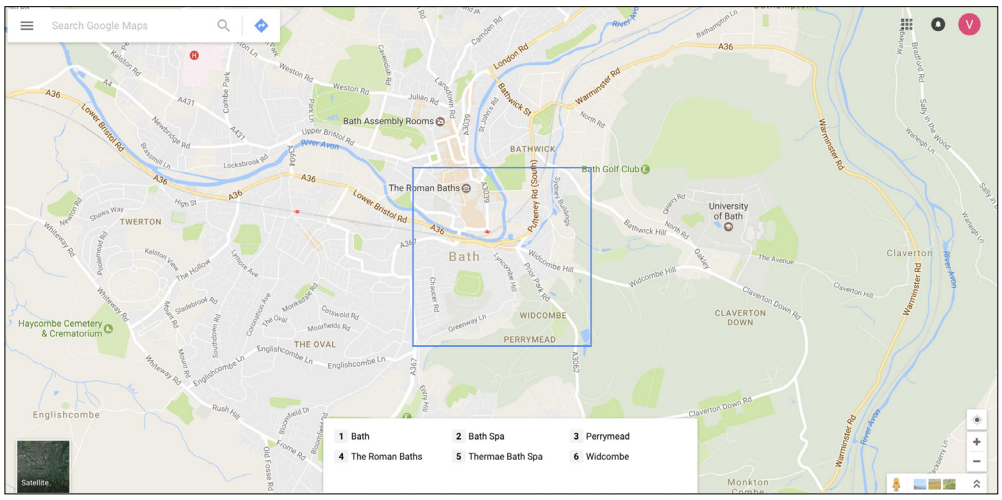
SCREEN READER REQUIREMENTS

- Add map at the current place in the DOM.
- Add hidden skip links so screen reader users can skip the map.
- When possible, use links for active regions of the interactive map.
- If you have to use something else make sure it has a text alternative.
- Remember: anything hidden with display will be shown with a screen reader.
- Allow users to navigate your app using sound by adding descriptive labels to UI elements. When using a screen reader such as TalkBack and navigating by touch exploration, labels are spoken aloud when users touch UI elements with their fingertips.

KEYBOARD ACCESSIBILITY

- Ensure all actions that can be achieved using the mouse can also be achieved using the keyboard or via touch (zoom, moving around the map, activating icons, ...).

GOOGLE, *Accessibility in Google Maps.*



Google Maps keyboard accessibility

- When possible, use links for active regions of the interactive maps.
- If you have to use something else like a glyphicon or a span, ensure that it is in the keyboard focus order by adding tabindex=0.

SIZE

- Ensure users can increase the size of the map, legend and any text.
- Often maps do not respond to browser requests to increase size; therefore additional methods may be required to provide a large version of the map, where the user has increased the normal text size by 200% and maximise a particular point/area, or add a highlight box that shows the particular point/area in larger size.

SOUND

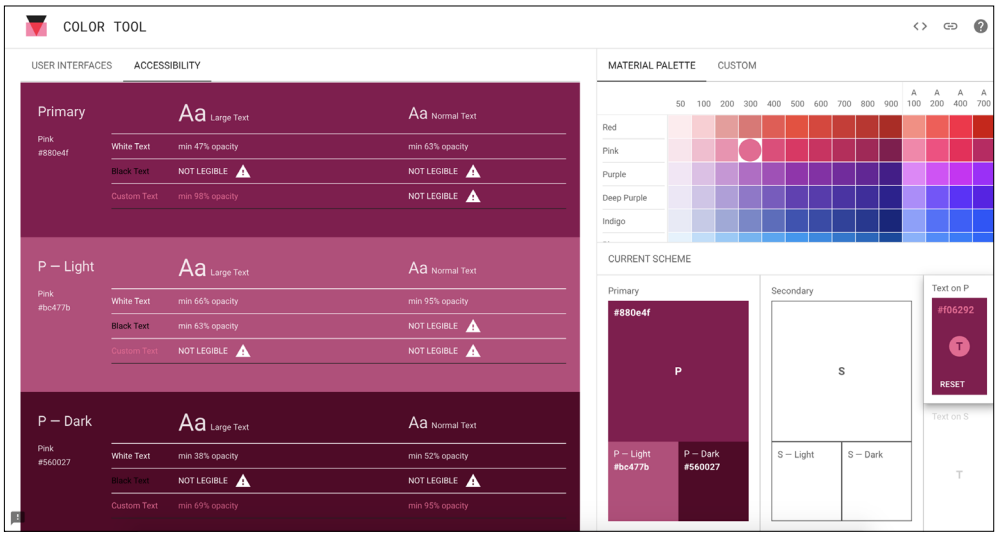
- Give visual alternatives to sound, and vice versa. Provide closed captions,

a transcript, or another visual alternatives to critical audio elements and sound alerts.
- Avoid unnecessary sounds (background music that autoplays when entering a web page - If there is background sound, ensure users can safely pause or stop it - extra sounds added to native elements - screen readers will be able to interpret native elements correctly).

COLOUR

- Ensure that your map design complies with the 4.5:1 colour contrast ratio.

W3C, *Contrast (Minimum)*, (2016).



Material Design Color Tool

Material Design Color Tool: https://material.io/color/#!/?view.left=0&view.right=0

Juicy Studio Luminosity Colour Contrast Analyser (by HEX value): http://juicystudio.com/services/luminositycontrastratio.php

The Paciello Group's Colour Contrast Analyser (by eye-dropper) (by eye-dropper): https://www.paciellogroup.com/resources/contrastanalyser/

- Do not rely on colour to differentiate important parts of the map. Ensure that your map use borders to separate one area from another; use different types of shading or textures; label markers with an icon and individual colours/icons for different markers
- Avoid the combination of red and green. The most common form of color blindness (6% of population) makes the users unable to distinguish the two colours.

COLOUR BLINDNESS TESTER:

No coffee vision simulator: https://chrome.google.com/webstore/detail/nocoffee/jjeeggmbnhckmgdhmgdckeigabjfbddl

Illustrator colour settings: http://www.adobe.com/accessibility/products/illustrator.html

MOTION

- Enable content that moves, scroll or blink to be paused, stopped or hidden.
- Avoid anything that flashes more than 3 times per second.

4 Principles and 12 Guidelines Which Will Help You Design for Accessibility

The following four principles – Perceivable, Operable, Understandable and Robust (POUR) – are easy to implement, and they will help you remember to design for accessibility whenever possible.

Principle 1: Perceivable "Information and user interface components must be presentable to users in ways they can perceive."

Principle 2: Operable "User interface components and navigation must be operable."

Principle 3: Understandable "Information and the operation of user interface must be understandable."

Principle 4: Robust "Content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including assistive technologies.

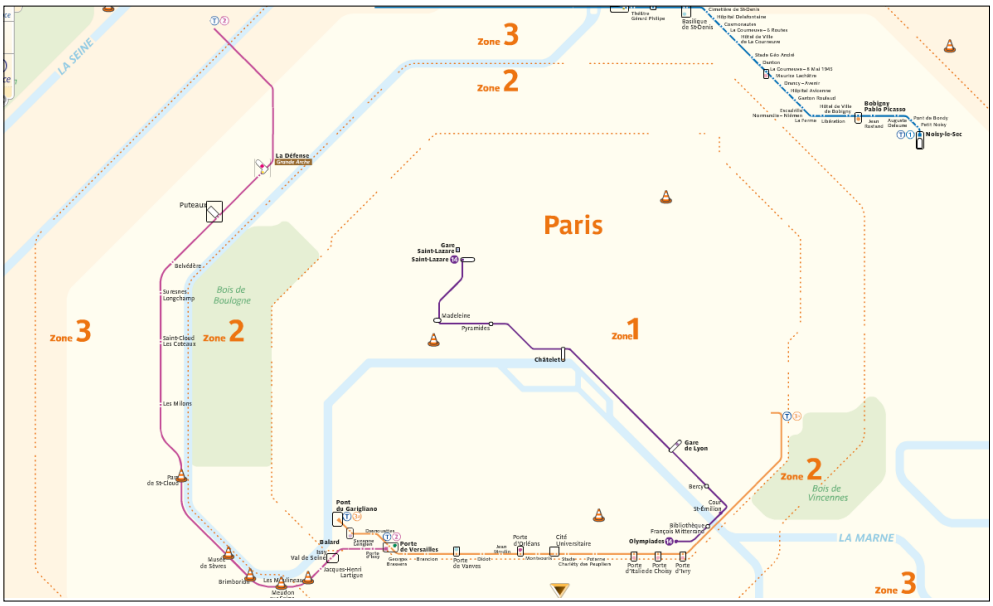
Third-Party Integrations

MOTION IMPAIRMENT

Motion impaired people, both wheelchair users and ambulant disabled people, have specific needs when it comes to directions to destinations (avoid stairs, narrow pavements, surfaces shared with vehicles, etc...). Alternative maps should be provided to users with special needs, as in London and Paris undergrounds examples.

Transport for London alternative maps
https://tfl.gov.uk/forms/12387.aspx

Paris underground accessible map
http://www.citymetric.com/transport/what-paris-metro-map-looks-if-youre-wheelchair-1153

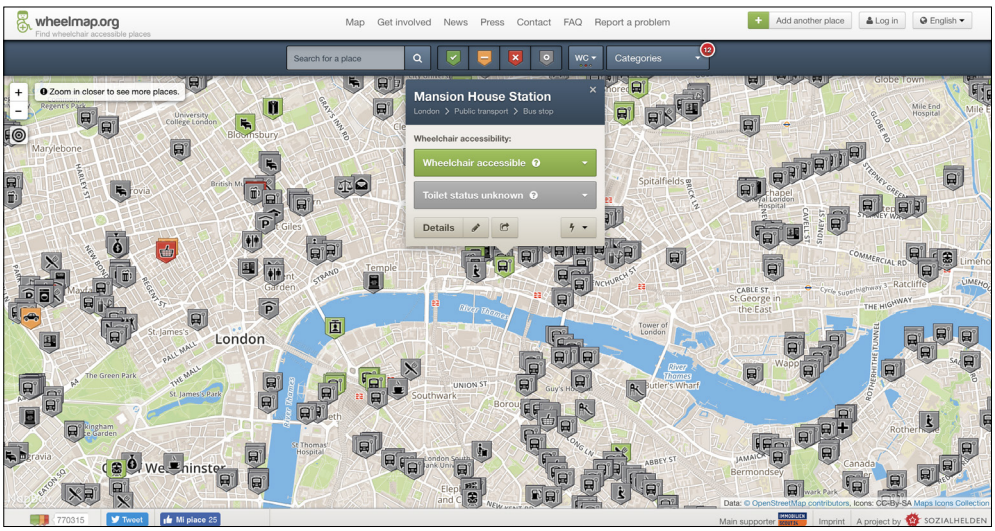


Paris underground map if you set it only to show stations with wheelchair access directly to trains with no need for staff assistance

Wheelchair users need to know which public spaces are wheelchair accessible, but the data doesn't exist yet. Wheelmap.org is an online, worldwide map for finding and marking wheelchair accessible places; anyone can find and add public places to the map and rate them according to a simple traffic light system. Google Maps now notes if a location is wheelchair accessible: accessibility info won't show for all locations — that data simply doesn't exist yet. Organisations like Wheelmap have been building up the dataset for a while, but the available data doesn't blanket major cities, much less the world. Google is turning to local guides (users who contribute location info in exchange for early access to new features) to grow their data set, but it'll take a while.

Wheelmap.org:
https://wheelmap.org/en/map#/?zoom=14

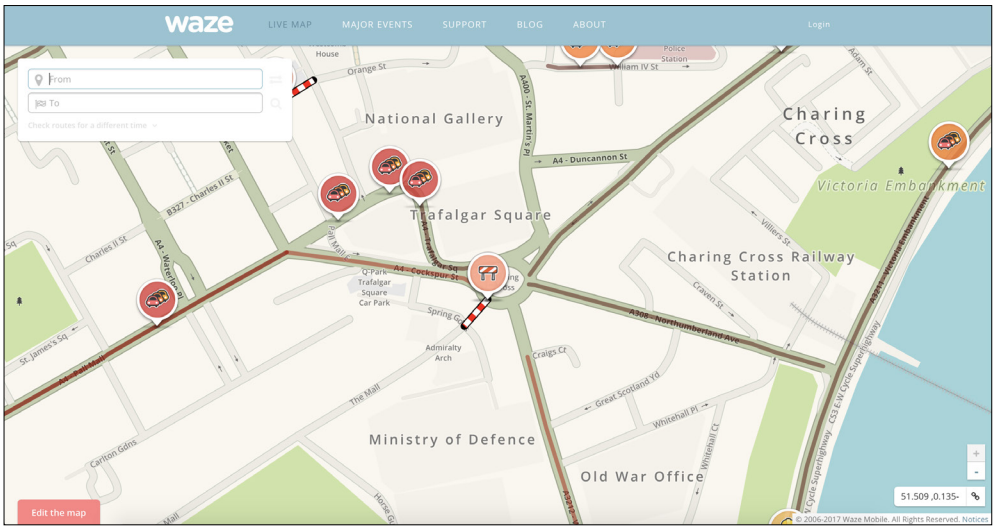
TECH CRUNCH, *Google Maps now notes if a location is wheelchair accessible,* (December 2016).



Wheelmap

Wheelchair users (as well as other disabled people e.g. blind people) need to avoid routes shared with vehicles. Temporary obstacles such as scaffoldings can make sidewalks inaccessible; therefore, a constant update of the map is necessary. In-route obstacles may be reported by users, similarly to Waze user-submitted traffic updates.

Waze:
https://www.waze.com/en-GB/?locale=en-GB



Waze Live Map

In Boston, the city has joined with Waze. The Boston traffic-management center uses Waze data to supplement live feeds from its network of traffic cameras and sensors, getting a more detailed picture of what's happening on city streets. Messages from Waze users can alert the center to traffic problems—a double-parked truck or a fender-bender—as soon as they develop, allowing officials to respond more quickly.

ANTHOPOULOS, L. G., *The Rise of the Smart City*, (April 2017). Understanding Smart Cities: A Tool for Smart Government or an Industrial Trick? (pp. 5-45). Springer International Publishing

VISION IMPAIRMENT

ClickAndGo Navigation is a patented wayfinding technology for blind, low-vision and mobility-challenged pedestrians. ClickAndGo Navigation includes tools the traveler can use to familiarise themselves with the venue before leaving their home (e.g. virtual tours and pre-journey learning feature). This kind of features can be useful even for people with hearing or communication impairments: since they will avoid asking for directions they are more prone to plan their travel in advance.

ClickAndGo:
http://www.clickandgomaps.com/clickandgo-navigation/

DYSLEXIA

OpenDyslexic is a new open source font created to increase readability for readers with dyslexia. The typeface includes regular, bold, italic, and bold-italic styles. It is being updated continually and improved based on input from dyslexic users. OpenDyslexic is free for Commercial and Personal use.

OpenDyslexic font
https://opendyslexic.org

HEARING IMPAIRMENT

Not all deaf people can read English language; moreover, for those who were born deaf, English is a foreign language. In order to make maps accessible to the hearing impairment persons, Boulares and Jemni built a solution that allows android devices users to use a route planner based on sign language interpretation.

BOULARES, M., & JEMNI, M., *A route planner interpretation service for hard of hearing people*, (2012). Computers Helping People with Special Needs, 52-58.

COMMUNICATION IMPAIRMENT

Samsung Wemogee is the first app free of instant messaging designed to allow patients affected by disorders related to verbal communication to express ideas, activities and emotions, working as a kind of emoji-text translator and vice versa.

STARTLR TECH, *Samsung Wemogee before free IM app affected by aphasia patients*, (April 2017)

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