Chapter 6

Enabling environments
“I have been forced to come up with practical solutions to face head-on with confidence an ill-equipped environment to live an active life with Muscular Dystrophy while, in parallel, campaigning for a more inclusive society. Among these private efforts, I have had to hire a driver/assistant who provides me with the support needed for transportation purposes. It is not an uncommon sight in Port-au-Prince to witness my assistant carrying me as we climb several flights of stairs, even at the tax office to pay my dues!”

Gerald

“After injury I felt that my social life has been affected so much, due to the difficulty of transportation and environment challenges, it is difficult to do the daily activities (visiting friends, going out…etc), as well as go to hospital appointments and rehabilitation. Before the injury I was an active member in the society, I had many friends and used to go out with them to do some activities and sports. But after the injury, it was difficult for me to go out with them, because the environment is not adapted for wheelchair users, either the streets, transportation, shops, restaurants, or other facilities.”

Fadi

“I am joining a first gathering of a group that discusses professional topics in psychology. The meeting was very stressful and frustrating for me, since I was not able to follow the group discussion. After the session was over, I called the instructor, told her about my hearing problem, and asked her permission to pass a special microphone between the speakers, a microphone that transmits their voices straight to my hearing-aids. To my surprise the instructor refused my request and said that it was not good for the group because it would ruin the atmosphere of spontaneity.”

Adva

“The hardest obstacle for my independence has been the attitude of the people. They think that we can’t do many things. Also, the steps and architectural barriers. I had an experience in the Casa de la Cultura with the director. There were many steps and I couldn’t enter so I sent someone to call for help and when the director came, surprised, he said ‘what’s happened, what’s happened, why are you like this’. He thought that I was there to beg for money, and had not thought that I was working.”

Feliza

“Until I was 19 years old, I had no opportunities to learn sign language, nor had Deaf friends. After I entered a university, I learned sign language(s) and played an active role as a board member of Deaf clubs. Since I completed graduate school, I worked as a bio-scientist in a national institute. I mainly communicate with my colleagues by hand-writing, while I use public sign language-interpreting service for some lectures and meetings. My Deaf partner and I have two Deaf children…my personal history gives me the distinct opinion that the sign language and Deaf culture are absolutely imperative for Deaf children to rise to the challenge.”

Akio
Enabling environments

Environments – physical, social, and attitudinal – can either disable people with impairments or foster their participation and inclusion. The United Nations Convention on the Rights of Persons with Disabilities (CRPD) stipulates the importance of interventions to improve access to different domains of the environment including buildings and roads, transportation, information, and communication. These domains are interconnected – people with disabilities will not be able to benefit fully from improvements in one domain if the others remain inaccessible.

An accessible environment, while particularly relevant for people with disabilities, has benefits for a broader range of people. For example, curb cuts (ramps) assist parents pushing baby strollers. Information in plain language helps those with less education or speakers of a second language. Announcements of each stop on public transit may aid travellers unfamiliar with the route as well as those with visual impairments. Moreover, the benefits for many people can help generate widespread support for making changes.

To succeed, accessibility initiatives need to take into account external constraints including affordability, competing priorities, availability of technology and knowledge, and cultural differences. They should also be based on sound scientific evidence. Often, accessibility is more easily achievable incrementally – for example, by improving the features of buildings in stages. Initial efforts should aim to build a “culture of accessibility” and focus on removing basic environmental barriers. Once the concept of accessibility has become ingrained and as more resources become available, it becomes easier to raise standards and attain a higher level of universal design.

Even after physical barriers have been removed, negative attitudes can produce barriers in all domains. To overcome the ignorance and prejudice surrounding disability, education and awareness-raising is required. Such education should be a regular component of professional training in architecture, construction, design, informatics, and marketing. Policy-makers and those working on behalf of people with disabilities need to be educated about the importance of accessibility.

The information and communication environment is usually constructed by corporate bodies with significant resources, a global reach and – sometimes – experience with issues of accessibility. As a result new technologies with universal designs are usually adopted more quickly in the virtual rather than in the built environment. But even with the rapid
World report on disability

Box 6.1. Definitions and concepts

**Accessibility** – in common language, the ability to reach, understand, or approach something or someone. In laws and standards on accessibility, it refers to what the law requires for compliance.

**Universal design** – a process that increases usability, safety, health, and social participation, through design and operation of environments, products, and systems in response to the diversity of people and abilities (1). Usability, though, is not the only goal of universal design, and “adaptation and specialized design” are a part of providing customization and choice, which may be essential for addressing diversity. Other overlapping terms for the same general concept are “design for all” and “inclusive design”.

**Standard** – a level of quality accepted as a norm. Sometimes standards are codified in documents such as “guidelines” or “regulations”, both with specific definitions, with different legal implications in different legal systems. An example is Part M of the Building Regulations in the United Kingdom of Great Britain and Northern Ireland. Standards can be voluntary or compulsory.

**Public accommodations** – buildings open to and provided for the public, whether publicly owned (such as courts, hospitals, and schools) or privately owned (such as shops, restaurants, and sports stadia) as well as public roads.

**Transportation** – vehicles, stations, public transportation systems, infrastructure, and pedestrian environments.

**Communication** – “includes languages, text displays, Braille, tactile communication, large print, and accessible multimedia as well as written, audio, plain-language, human-reader and augmentative and alternative modes, means, and formats of communication, including accessible information and communication technology” (2). These formats, modes, and means of communication may be physical, but are increasingly electronic.

development of information and communication technology (ICT), accessibility can be limited by unaffordability and unavailability. As new technologies are created in rapid succession, there is a danger that access for people with disabilities will be overlooked and that expensive assistive technologies will be opted for, rather than universal design.

This chapter focuses on the environmental barriers to gaining access to buildings, roads, transport and information and communication and the measures needed to improve access (see Box 6.1).

**Understanding access to physical and information environments**

Access to public accommodations – **buildings and roads** – is beneficial for participation in civic life and essential for education, health care, and labour market participation (see Box 6.2). Lack of access can exclude people with disabilities, or make them dependent on others (6). As an example, if public toilets are inaccessible, people with disabilities will find it difficult to participate in everyday life.

**Transportation** provides independent access to employment, education, and health care facilities, and to social and recreational activities. Without accessible transportation, people with disabilities are more likely to be excluded from services and social contact (7, 8). In a study in Europe, transport was a frequently cited obstacle to the participation of people with disabilities (9). In a survey in the United States of America lack of transportation was the second most frequent reason for a person with disability being discouraged from seeking work (10). The lack of public transportation is itself a major barrier to access, even in some highly developed countries (11).

A lack of accessible **communication and information** affects the life of many disabled people (12–14). Individuals with communication difficulties, such as hearing impairment or
Box 6.2. Political participation

Article 29 of the United Nations Convention on the Rights of Persons with Disabilities (CRPD) guarantees political rights to people with disabilities, first by highlighting the importance of accessible voting processes, electoral information and the right of people with disabilities to stand for election, and second, by advocating for people with disabilities to form and join their own organizations and participate in political life at every level.

Enabling environments are critical to promoting political participation. Physical accessibility of public meetings, voting booths and machines, and other processes is necessary if people with disabilities are to participate. Accessibility of information – leaflets, broadcasts, web sites – is vital if people are to debate issues and exercise informed choice. For example, sign language and closed captioning on party political broadcasts would remove barriers to deaf people and those with hearing loss. People who are confined to their home or live in institutions may need postal voting or proxy voting to exercise their franchise. The wider question of attitudes is also relevant to whether people with disabilities are respected as part of the democratic process – as voters, election observers, commentators or indeed elected representatives – or identify with mainstream society (3). In particular, people with intellectual impairments and mental health conditions often face discriminatory exclusion from the voting process (4).

The International Foundation for Electoral Systems has worked in different countries to promote voter registration and remove barriers to participation by people with disabilities as voters and as candidates, for example, a voter education programme in Iraq, registration and voting support in Kosovo (in association with OSCE) and initiatives in Armenia, Bangladesh, and other countries. In the United Kingdom the voluntary organization United Response has campaigned and developed resources to promote electoral participation of people with intellectual impairments (5).

In India, while the 1995 Disability Act guaranteed equal opportunities to disabled people, this had no impact on subsequent electoral processes. The disability movement in India campaigned vigorously for access to the political system, particularly in the run-up to the 2004 elections. The Supreme Court passed an interim order for state governments to provide ramps in all polling booths for the second round of voting in 2004, with Braille information to be available in future elections. In 2007 the Supreme Court passed an order by which the Election Commission was directed to instruct all the State Governments and Union Territories to make the following provisions for the 2009 General Elections:

- Ramps in all polling stations.
- Braille numbers by ballot buttons on Electronic Voting Machines.
- Separate queues for disabled people at polling stations.
- Electoral staff trained to understand and respect the needs of people with disabilities.

As a result of the campaigning and awareness-raising, the leading parties explicitly mentioned disability issues in their 2009 manifestos.

Increased political participation of people with disabilities may result in progress towards more disability-inclusive public policy. While progress has been achieved in making elections accessible, it is rare for people with disabilities to be elected to public positions. However, in countries including the United States, the United Kingdom, Germany, Ecuador, and Peru, persons with disabilities have held the highest office. In Uganda Section 59 of the Constitution of 1995 states that “Parliament shall make laws to provide for the facilitation of citizens with disabilities to register and vote,” while Section 78 provides for representation of people with disabilities in Parliament. People with disabilities are elected through an electoral college system at all levels from village up to Parliament, giving influence which has resulted in disability-friendly legislation. Uganda has among the highest numbers of elected representatives with disabilities in the world.

speech impairment, are at a significant social disadvantage, in both developing and developed countries (15). This disadvantage is particularly experienced in sectors where effective communication is critical – such as those of health care, education, local government, and justice.

- People who are hard of hearing may need speech-reading, assistive listening devices, and good environmental acoustics in indoor settings (16). Deaf and deafblind people use sign languages. They need bilingual education in sign language and the national language, as well as sign language interpreters, including tactile or hands-on interpreters (17, 18). According to World Health Organization (WHO) estimates, in 2005, around 278 million people worldwide have moderate to profound hearing loss in both ears (19).

- People who are blind or have low vision require instruction in Braille, equipment to produce Braille materials, and access to library services that provide Braille, audio and large-print materials, screen readers, and magnification equipment (20, 21). About 314 million people around the world have impaired vision, due either to eye diseases or uncorrected refractive errors. Of this number, 45 million people are blind (22, 23).

- People with intellectual impairments need information presented in clear and simple language (24). People who have severe mental health conditions need to encounter healthworkers who have the communication skills and confidence to communicate effectively with them (25).

- Non-speaking individuals need access to “augmentative and alternative communication” systems and acceptance of these forms of communication where they live, go to school and work. These include communication displays, sign language and speech-generating devices.

Available empirical evidence suggests that people with disabilities have significantly lower rates of ICT use than non-disabled people (26–29). In some cases they may be unable to access even basic products and services such as telephones, television and the Internet.

Surveys on access to and the use of digital media in developed countries have found that disabled people are half as likely as non-disabled people to have a computer at home, and even less likely to have Internet access at home (30, 31). The concept of the digital divide refers not only to physical access to computers, connectivity, and infrastructure but also to the geographical, economic, cultural and social factors – such as illiteracy – that create barriers to social inclusion (31–36).

### Addressing the barriers in buildings and roads

Prior to the CRPD the main instrument addressing the need for improved access was the United Nations Standard Rules on Equalization of Opportunities for Persons with Disabilities, which lacked enforcement mechanisms. A United Nations survey in 2005 of 114 countries found that many had policies on accessibility, but they had not made much progress (37). Of those countries, 54% reported no accessibility standards for outdoor environments and streets, 43% had none for public buildings, and 44% had none for schools, health facilities, and other public service buildings. Moreover, 65% had not started any educational programmes, and 58% had not allocated any financial resources to accessibility. Although 44% of the countries had a government body responsible for monitoring accessibility for people with disabilities, the number of countries with ombudsmen, arbitration councils, or committees of independent experts was very low.

The gap between creating an institutional and policy framework and enforcing it has been ascribed to various factors, including:

- lack of financial resources;
- a lack of planning and design capacity;
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- limited research and information;
- a lack of cooperation between institutions;
- a lack of enforcement mechanisms;
- a lack of user participation;
- geographic and climatic constraints;
- a lack of a disability-awareness component in the training curricula of planners, architects and construction engineers.

Reports from countries with laws on accessibility, even those dating from 20 to 40 years ago, confirm a low level of compliance (38–41). A technical survey of 265 public buildings in 71 cities in Spain found that not a single building surveyed was 100% compliant (40), and another in Serbia found compliance rates ranging between 40% and 60% (40). There are reports from countries as diverse as Australia, Brazil, Denmark, India, and the United States of similar examples of non-compliance (39, 40, 42, 43). There is an urgent need to identify the most effective ways of enforcing laws and regulations on accessibility – and to disseminate this information globally.

Developing effective policies

Experience shows that voluntary efforts on accessibility are not sufficient to remove barriers. Instead, mandatory minimum standards are necessary. In the United States, for example, the first voluntary accessibility standard was introduced in 1961. When it became clear that the standard was not being used, the first law on accessibility, covering all federal buildings, was passed in 1968, after which standards were generally adhered to (44). In most countries that took measures early on, accessibility standards have evolved over time, especially in the domain of public accommodations. Recently some countries, such as Brazil, have extended their laws to private businesses that serve the public.

In new construction, full compliance with all the requirements of accessibility standards is generally feasible at 1% of the total cost (45–47). Making older buildings accessible requires flexibility, because of technical constraints, issues of historic preservation and variability in the resources of the owners. Laws, such as the 1990 Americans with Disabilities Act in the United States and the Disability Discrimination Act of 1995 in the United Kingdom, introduced legal terms such as “reasonable accommodations”, “without undue hardship”, and “technically infeasible”. These terms provided legally acceptable ways in which to accommodate the constraints in existing structures. The concept of “undue hardship”, for example, allows more leeway to small businesses than to large corporations in making renovations that are costly because of the nature of existing structures.

Expanding the scope of buildings covered by laws and standards after introducing a first stage of accessibility may be a better approach than trying to make everything fully accessible. For developing countries, a strategic plan with priorities and a series of increasing goals can make the most of limited resources. Policy and standards might, in the first instance, treat traditional construction in low-income rural areas differently from other types of construction – focusing, perhaps, on ground-floor access and access to public toilets. After experimenting with different approaches for a limited period, more extensive standards might be introduced, based on knowledge of what works. The CRPD refers to this strategy as “progressive realization”.

Improving standards

Standards for accessibility can create an enabling environment (38–40). Evaluations of existing standards have found generally low awareness about the existence of standards. For those aware of the standards, concerns were raised about their appropriateness, especially for resource-poor settings, including rural areas with traditional forms of construction and informal settlements. Relief workers, for instance, have reported accessibility standards to be inappropriate for the problems in refugee camps and reconstruction projects following natural disasters (48).
Contemporary standards have been developed through a largely consensual process. The participation of people with disabilities in developing standards is important for providing insight about the needs of users. But a systematic, evidence-based approach to standards is also needed. Evaluations of the technical accessibility provisions in high-income settings have found that wheelchair clearance and space requirements are often too low (49, 50). These shortcomings stem from the changing characteristics of assistive technology such as bigger wheelchairs, from the advances in knowledge about how to facilitate access, and from the time lag for incorporating new knowledge into standards.

The basic features of access in new construction should include:
- provision of curb cuts (ramps)
- safe crossings across the street
- accessible entries
- an accessible path of travel to all spaces
- access to public amenities, such as toilets.

A compilation of data on 36 countries and areas in Asia and the Pacific showed that 72% have accessibility standards for either the built environment or public transport or both. An assessment of the content of standards and coverage is required to understand the scope and application of these norms (51). Most accessibility standards concentrate on the needs of people with mobility impairments. The relevant standards, for instance, contain many criteria to ensure enough space and manoeuvring clearances for wheelchair and walking-aid users. It is also important to meet the needs of people with sensory impairments, primarily avoiding hazards and finding the right way. To this end, communication methods have been devised – including visual alarms and better contrasts on signs, Braille signage, tactile paving, and dual modes on interactive devices, such as automated teller machines in banks and ticket machines.

Accessibility standards rarely explicitly address the needs of people with cognitive impairments or mental health conditions. Universal design guidelines do deal with matters such as better support for finding the way and for reducing stress which can be considered in accessibility standards (52).

Appropriate standards are needed for rural construction in developing countries. A study on accessibility in rural villages in Gujarat, India, found that current practices in affluent urban areas in India were not appropriate in these villages (53). Other studies on accessibility for persons with disability in developing countries have focused on hygiene and the use of water (54, 55) and proposed simple, low-cost solutions to make toilet facilities, water-carrying devices, water stands, and other facilities accessible.

Standards on accessibility are also needed in refugee camps and in informal settlements and reconstruction projects after a disaster. Studies of informal settlements in India and South Africa have found that the conditions there, as in poor rural areas, require different approaches to accessibility than urban areas – providing access to squat toilets and overcoming open drains, which create obstacles for wheelchair and pedestrian use. The serious security and privacy barriers in these communities are as important as independence in carrying out daily tasks (56). The Sphere Handbook, developed by more than 400 organizations around the world, sets out the minimum standards in a disaster response and includes approaches for meeting the needs of people with disabilities. In its 2010 update disability is addressed as an issue cutting across all the main sectors, including water supply, sanitation, nutrition, food aid, shelter, and health services (57).

Standards in industrialized countries have driven a “global convergence” in accessibility standards (8) rather than standards in developing countries reflecting cultural or economic conditions (58). Whether this accounts for the lack of implementation of accessibility laws and standards in many countries requires further research.

The International Organization for Standardization developed an international accessibility standard using a consensual
approach, though not all regions of the world are represented on the committee. International and regional organizations can help improve standards by providing recommendations for member countries. The European Concept for Accessibility Network has taken this approach by publishing a technical manual to help organizations develop standards and regulations incorporating universal design.

An international effort is needed to develop standards appropriate for different stages of policy evolution, different levels of resources, and cultural differences in construction.

**Enforcing laws and regulations**

The reporting guidelines for the CRPD obliges States Parties to report on progress in achieving Article 9 (Accessibility). Systematic comparison is difficult, but several practices can lead to better enforcement:

- **Laws with mandatory access standards** are the most effective way to achieve accessibility. The first accessibility standard in the world – a voluntary one in the United States – demonstrated a very low level of adoption. Similar results are reported in other countries. Standards and compliance should be regulated and mandated by law.

- **Good design reviews and inspections** ensure that accessibility will be provided from the day a building is completed. Accessibility standards thus need to be part of building regulations. The delays caused by the denial of permits for construction or occupancy should provide an incentive for builders and developers to meet the rules. If there are no design reviews or inspections, the law can require effective penalties for non-compliance, as well as a mechanism for identifying non-compliance and correcting the offence. Government funding agencies – including those that fund health care facilities, transportation, and schools – can also review plans as part of their approval process, using consistent standards.

- **Accessibility audits** can also be conducted by disability organizations – or even by individual citizens. Such audits can encourage compliance. In Malaysia, for example, groups working on behalf of disabled people are completing audits of major hotels (see Box 6.3).

**The lead agency**

A lead government agency can be designated to take responsibility for coordinating the activities of other bodies involved with accessibility, particularly those that fund the construction of public buildings and monitoring the implementation of laws, regulations, and standards. Furthermore, it could oversee the licensing of design professionals, businesses, and services to ensure that accessibility is part of professional training curricula.

Implementing accessibility programmes requires adequate funding for the lead agency and other responsible agencies. Appropriate financing mechanisms need to be developed at various budget levels to ensure efficient flow of funding. There may often be penalties for non-compliance in access legislation, but the law may not be enforced, because of a lack of resources.

**Monitoring**

Monitoring and evaluation of the implementation of accessibility laws and standards will provide information to make continual improvements in accessibility for people with disabilities. An impartial monitoring body, preferably outside government, could be designated and funded to provide periodic independent evaluations of progress on accessibility laws and standards and to recommend improvements, as with the United States National Council on Disability. This body should have a significant membership of people with disabilities. Without such monitoring, there will be no pressure on governments to move towards full accessibility.

In addition to an official monitoring body, a network of local action organizations...
There is an important role for people with disabilities and other members of the general public to be vigilant and seek redress, through legal and administrative actions, when building owners do not fulfil their obligations under the law. A combination of regulation, persuasion, and powerful interest groups can be most effective (see Box 6.3) (67).

**Education and campaigning**

Education, along with technical assistance on enforcement procedures, is essential to improve awareness of the need for accessibility and understanding of universal design. Educational programmes should be targeted to all those involved in enforcing accessibility laws and standards – including people with disabilities, design educators and professionals (68), government regulators, business owners and managers, and building developers and contractors (see Box 6.4).
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Adopting universal design

Universal design is practical and affordable, even in developing countries (53, 54). Simple examples in lower income settings include:

- a seating platform next to a communal hand pump to provide an opportunity for rest and enable small children to reach the pump (54);
- ramped access and a concrete apron at the pump post to help wheelchair users, making it possible to bring large, wheeled water containers to the village pump and reduce the number of trips (53);
- a bench fitted over a pit latrine, making latrine use easier (54).

Box 6.4. Creating an environment for all in India

India had outlined provisions for accessibility in the Persons with Disabilities Act, 1995 and building by-laws on accessibility. Research in four districts of Gujarat, India – by a local development organization, UNNATI Organisation for Development Education – identified accessibility to physical spaces as a key area for mainstreaming the rights of people with disabilities. A project was launched to build awareness in the region on accessibility, increase the capacity for local action, and build strategic alliances for advocacy by:

- setting up an informal “access resource group”, bringing together architects, builders, designers, engineers, people with disabilities, and development and rehabilitation professionals;
- staging public events highlighting what can be done to improve access; greater stress was placed on the message that “access benefits all”. Campaigns had the greatest impact when user groups acted collectively for their rights;
- conducting media training;
- holding workshops on accessibility, including national policies on disability and access;
- producing educational materials.

Initially, the access group contacted public and private institutions to raise awareness on the need for better accessibility. Within two years, they were receiving requests for audits. In these audits, members of the access group worked with people with disabilities to formulate technical recommendations.

Between 2003 and 2008, 36 audits were conducted of parks, government offices, academic institutions, banks, transport services, development organizations, and public events. Modifications were made in about half the venues, including:

- providing accessible parking spaces, ramps, and lifts
- installing accessible toilets
- adjusting counter heights
- providing tactile maps and improving signage.

For example, with government support, the State Administrative Training Institute for government officials in Ahmedabad, the state capital, has become a model of accessible building. Programmes of modifications required regular follow-up to support the implementation of recommendations for standard specifications. The maintenance of access features was best achieved when both users and managers of a space were aware of the importance of these features.

The project has shown architects and builders how to comply with the access provisions in the Persons with Disabilities Act 1995 and local access by-laws. A design institute in Ahmedabad now offers an elective course on universal design. People with disabilities have seen benefits in greater dignity, comfort, safety, and independence. All the same, non-compliance has resulted in new barriers. Accessibility for people with visual impairments remains a problem, with signage standards not commonly followed due to limited information in accessible user-friendly formats.

Source (69).
An important application for universal design is to provide for emergency evacuations from buildings. Experience from major disasters has shown that people with disabilities and older people are often left behind (70). Other problems can also arise, such as when people dependent on ventilators are moved by unprepared first responders (71). In many places, work is being done on finding better management approaches for emergencies by improving building design, providing training, and running preparedness exercises (72, 73). Universal design can also help in enabling communications and assistance during evacuations, with new technologies ensuring that people with sensory and cognitive impairments are kept informed about the emergency and not left behind.

Addressing the barriers in public transportation

Worldwide, initiatives to develop accessible public transportation systems focus primarily on:

- improving accessibility to public transportation infrastructure and services;
- setting up “special transport services” for people with disabilities;
- developing campaigns and education programmes to improve policies, practices, and the use of services.

Specific obstacles are related to each of these goals.

Lack of effective programmes. Even where laws on accessible transportation exist, there is limited degree of compliance with the laws, especially in developing countries (7, 74). The benefits of universal design features are often not well understood. For this reason, many policy initiatives are not incorporated – such as using raised boarding platforms at the entrance to buses to reduce the boarding times for all passengers, as well as increasing accessibility (7).

Obstacles to special transport services and accessible taxis. Special transport services (STS) are designed specifically for people with disabilities or for other groups of passengers unable to access public or private transportation independently. STSs and taxis are forms of “demand-responsive transport” providing service only when requested by the customer. But accessible vehicles are expensive to purchase, and the cost to the provider of operating the service is high. And if demand increases, for example due to population ageing, the economic burden of STS, if provided by a public agency, can become unsustainable (75, 76).

For the service user, availability is often limited because of eligibility requirements and travel restrictions. While taxis are potentially a very good way to supplement accessible public transit, most taxi services do not provide accessible vehicles. In addition, there have been many instances of discrimination by taxi operators against people with disabilities (77, 78).

Physical and information barriers. Typical barriers in transportation include inaccessible timetable information, a lack of ramps for vehicles, large gaps between platforms and vehicles, a lack of wheelchair anchoring in buses, and inaccessible stations and stops (7, 79).

Existing commuter rail systems and ferries are particularly difficult to make accessible because of variations in platform heights, platform gaps, and vehicle designs (80). Improved visual environments are needed to accommodate people with visual impairments and elderly people – for example, with colour-contrasting railings and better lighting (8).

Lack of continuity in the travel chain. The “travel chain” refers to all elements that make up a journey, from starting point to destination – including the pedestrian access, the vehicles, and the transfer points. If any link is inaccessible, the entire trip becomes difficult (81). Many mass transit providers, particularly in developing countries, have implemented accessibility only partially, for example by providing a limited number of accessible vehicles on each route, making improvements only to the main stations, and providing access only on new lines.
Without accessibility throughout the travel chain, the job is incomplete. Inaccessible links require taking an indirect route, creating the barrier of longer travel times. The goal must be for people to have access to all vehicles and the full service area, as well as the pedestrian environment (82). But progressive realization may be the most practical short-term response.

**Lack of pedestrian access.** A major obstacle to maintaining continuity of accessibility in the travel chain is an inaccessible pedestrian environment, particularly in the immediate surroundings of stations. Common problems here include:

- nonexistent or poorly maintained pavements;
- inaccessible overpasses or underpasses;
- crowded pavements in the vicinity of stations and stops;
- hazards for people with visual impairments and deafblind people;
- lack of traffic controls;
- lack of aids at street crossings for people with visual impairments;
- dangerous local traffic behaviours.

These can be a particular problem in low-income urban environments.

**Lack of staff awareness and other barriers.** Operators of transport often do not know how to use the accessibility features that are available or how to treat all passengers safely and courteously. Outright discrimination by operators, such as not stopping at a bus stop, is not uncommon. Operating rules may conflict with the need to assist people with disabilities. In many places there are no fixed procedures for identifying and resolving problems with the service. Overcrowding, a major problem, particularly in developing countries, contributes to disrespectful behaviour towards passengers with disabilities.

**Improving policies**

Including access to transportation as part of the overall legislation on disability rights is a step towards improving access. Standards for accessibility in developed countries, however, are not always affordable or appropriate in low-income and middle-income countries (7). Solutions should be found to meet challenges specific to developing country contexts. Where aid programmes provide significant funding to build new mass transit systems, access requirements can be included.

Coordinated political action, both national and local, is needed to pass laws and ensure that laws are enforced. Local action is particularly important, not only when new systems are planned, but also to keep a running check on operations. National organizations in many countries have expertise in accessible transportation. Because of their special knowledge, they often receive government funding to document and disseminate best practices and offer training programmes to transport providers and to local groups working on behalf of disabled people.

National laws and rules on funding can oblige local transit authorities to have advisory bodies consisting of people with disabilities.

Fare structures are a critical element of local transit policies: reduced or free fares for people with disabilities, funded by local or national government, are a feature of most accessible public transportation initiatives, as in the Russian Federation.

**Providing special transport services and accessible taxis**

Transportation agencies can be required by law to provide STS as part of their service. In such a case this may be an incentive for agencies to increase accessibility in the overall system due to the eventual high cost of providing STS. While STS initially appears less costly and easier to implement than removing barriers to mass transportation, relying on that alone for accessible transport leads to segregation. And in the longer term it may result in high and possibly unsustainable costs as the proportion of older people in the population increases.

**Shared vans.** Shared vans equipped with lifts, individually owned and operated by
Licensed providers, can be a viable way to start an STS programme for fairly small initial public investment. In India a team of designers found inexpensive ways of making small vans accessible for people with disabilities, with costs as low as US$ 224 (83). Having a wider passenger base can help make shared van services more sustainable in the longer term. In Curitiba, Brazil, owner-operated vans with lifts pick up passengers for a flat-rate fare.

**Accessible taxis.** Accessible taxis are an important part of an integrated accessible transportation system because they are highly demand-responsive (77, 84). Taxis and STSs are now being combined in many places. Sweden relies extensively on taxis for its STS, as do other countries (77, 85). In developing countries, accessible taxis are slower to come on line. Licensing regulations can require taxi fleets not to discriminate against people with disabilities. They can also require some or all vehicles to be accessible. In the United Kingdom a special initiative to make taxis accessible has resulted in a fleet that is 52% accessible (86).

**Flexible transport systems.** Innovative universal design solutions could increase availability and affordability. Information technology is making it possible to optimize routes and assign passengers to specific vehicles in real-time while vehicles are on the road. Originally developed in Sweden using a fleet of shared ride vans and since introduced in some other European countries, these “flexible transport systems” (FTSs) provide services on demand, at about half the cost of a taxi and with greater flexibility in reservation times, availability, and routes (85). The cost of accessible taxis, though, and the infrastructure for an FTS, may be prohibitive for some developing countries (but note the examples of affordable van solutions from India and Brazil). As these innovations are adopted more widely, there should be attempts to make them cheaper and bring them to low-income and middle-income countries.

**Universal design and removing physical barriers**

Making every vehicle entrance-accessible in existing systems may require purchasing new vehicles and, in some cases, renovating stops and stations. In Helsinki, Finland, the existing tram system was made accessible by using both these methods. The stops in the middle of the road are on safety islands equipped with short ramps at each end, accessed from the middle of marked pedestrian crossings. The islands are at the same level as the low floors of the new vehicles. Passengers can now wait in a safer environment, and there is no need to mount steps to enter the vehicle.

Portable lifts or manual folding ramps can create access to existing vehicles. But such solutions should be viewed as temporary, because they require properly trained attendants available for every vehicle arrival or departure. Nor are elevated small platforms served by lifts or ramps the most effective solutions because of the difficulty of stopping a train or bus in exactly the right position.

**Rail systems.** Bus and tram systems can potentially be renovated at relatively low cost over time as new vehicles go into service. But renovating existing rail systems presents various technical difficulties, including (80):
- dealing with the size of the gaps between vehicle floors and the platforms, which may be different at every station (87);
- increasing space in vehicles for wheelchair access;
- providing access to tracks at different levels within stations.

Technologies for automated lifts, bridge-plates, and ramps overcome the problems with platforms. Some new accessible cars can be provided on each train, and their number can be increased over time. Old single-level cars can be renovated to provide space by removing existing seats or replacing them with folding seats. Elevators or inclined lifts to reach upper or
lower platforms can also be installed. A useful starting initiative is to make the main stations fully accessible, along with accessible bus transportation from the accessible stations to the locations served by the inaccessible stations.

In time more stations can be made accessible. Following the Transportation Accessibility Improvement Law (2000), the Tokyo subway system has become significantly more accessible: in 2002, 124 of the 230 stations in the Tokyo area had lifts; by 2008, 188 had lifts. A web site offers information on accessible routes.

**Bus rapid transit systems.** Large cities – including Beijing (China) and New Delhi (India) – have embarked on major programmes to upgrade their public transport, often using rail (88). There is a global trend towards “bus rapid transit” which is particularly pronounced in developing countries of Central and South America and of Asia. Low-floor buses are often used to provide access. Accessible bus rapid transit systems have been constructed in Curitiba (Brazil), Bogotá (Colombia), Quito (Ecuador) and more recently Ahmedabad (India) and Dar es Salaam (United Republic of Tanzania) (88). When cities host important international events new transit lines are often added to accommodate the expected large numbers of people attending (80). Although there can be resistance to new services from existing taxi operators and local residents (89), these projects offer the opportunity to create a good model that can subsequently be applied more widely in the country.

**Alternative forms of transport.** Rickshaw and pedicab services, common in many Asian cities, are gaining in popularity on other continents. An Indian design team has developed a type of pedicab that is easier for people with disabilities to get in and out of, improving access for all users and providing more comfort for the driver (83). Installing separate lanes and paths for bicycles, tricycles, and scooters can improve safety and accommodate the larger tricycle-style wheelchairs often used in Asia.

**Universal design.** Universal design is increasingly being adopted in bus and rail transit operations in high-income countries, as in Copenhagen’s underground rail system (76, 90, 91). The most important universal design innovation is the low-floor transit vehicle, adopted for heavy rail, light rail, trams, and buses, providing almost level access from curbs and short-ramp access from street levels.

Other examples of universal design include:
- lifts or ramps on all transit vehicles – not only on a limited number;
- a raised pad at a bus stop with ramp access, making it easier for someone with mobility impairment to enter a bus, helping visually impaired and cognitively impaired individuals find the stop, and improving the safety of all those waiting for a bus (79);
- real-time information on waiting times;
- smart cards for fare collection, gates, and ticketing;
- visual and tactile warning systems at the edge of platforms – or full safety barriers along the entire platform;
- railings and posts painted in bright contrasting colours;
- audible signs to help people with visual impairments find gates and identify buses.
- web access to real-time information about accessible routes and temporary obstacles, such as a lift out of order (80).

Many of the universal design innovations mentioned above are generally too expensive for developing economies. Affordable universal design concepts are needed for low-income and middle-income countries. More research is needed to develop and test for effectiveness solutions that are inexpensive and appropriate for such countries. Some simple low-cost examples of universal design include:
- lower first steps;
- better interior and exterior handrails at entrances to buses;
- priority seating;
- improved lighting;
- raised paved loading pads where there are no pavements;
- the removal of turnstiles.
Curitiba’s integrated system is a good model of a less expensive universal design approach (see Box 6.5). Delhi Metro also incorporated universal design features in the design phase at little extra cost (43).

**Box 6.5. Integrated public transport in Brazil**

In 1970 the city of Curitiba, Brazil, introduced a modern transportation system designed from the start to replace a system of many poorly coordinated private bus lines. The aim was to provide public transport that would be so effective that people would find little need for private transport. The system was to provide full accessibility for people with disabilities, as well as benefits for the general population from the adoption of universal design. The new system includes:

- express bus lines with dedicated right-of-way routes into the city centre;
- conventional local bus routes connecting at major terminals;
- interline “connector” buses travelling around the perimeter of the city;
- “Parataxi” vans for door-to-terminal service for those requiring them.

All terminals, stops, and vehicles are designed to be accessible. At terminals used by different types of transport, local buses deliver passengers to the stops on the express bus system. The vehicles are large “bus-trains” – two-unit or three-unit articulated buses, each carrying 250–350 people. These bus-trains load and unload directly onto raised platforms with the help of mechanized bridge plates that span the platform gap. All express bus terminals have ramps or lifts.

Private individuals operate the “parataxi” vans. Originally, these were designed specifically for people with disabilities, as a means of getting from their homes to a station. There was not enough demand, though, to make the vans economically viable on this basis, and they are now available for all passengers.

The Curitiba system is a good example of universal design. It gives a high level of access, and the integrated system of local routes, interline routes, and express routes provides a convenient and seamless means of travelling. The vehicles for each type of line are colour-coded, making them easy to distinguish for those who do not read. Although there are newer rapid-transit systems in existence, lessons can be learned from Curitiba.

- Even in developing countries accessibility can be provided relatively easily throughout a transportation system if it is an integral part of the overall plan from the start.
- Platform boarding allows for the convenient and rapid movement of passengers and provides full accessibility.
- The construction of “tube” stations requires the express buses to stop at a distance from the edge of the platform, to avoid hitting the curved station walls. In Curitiba, the emphasis was on improving the boarding and alighting from vehicles for people with mobility impairments. While certain features help other people with disabilities to find their way around the system, more attention needs to be paid to people with sensory and cognitive impairments.

Assuring continuity in the travel chain

Establishing continuity of accessibility throughout the travel chain is a long-term goal. Creating steady improvements over a longer period requires campaigning, intelligent policy-making with appropriate resource allocation, and effective monitoring. Methods for achieving the goal include (8, 92):

- determining the initial priorities, through consultations with people with disabilities and service providers;
- introducing accessibility features into regular maintenance and improvement projects;
- developing low-cost universal design improvements that result in demonstrable benefits to a wide range of passengers, thus gaining public support for the changes.

Improving the quality of pavements and roads, installing ramps (curb cuts), and ensuring
access to transport facilities is a key aspect of the travel chain and indispensable for people with disabilities. Planning pedestrian access to stations involves a range of agencies – including highway departments, local business groups, parking authorities, and public safety departments – and would benefit from involvement by people with disabilities. Neighbourhood participation will contribute local knowledge – such as the location for pedestrian crossings on dangerous streets. Independent organizations with special expertise in pedestrian planning and design can help with local surveys and plans.

Improving education and training

Continual education of all those involved in transportation can make sure that an accessible system is developed and maintained (92). Education should start with training for managers, so that they understand their legal obligations. Front-line staff need training about the range of disabilities, discriminatory practices, how to communicate with people with sensory impairments, and the difficulties people with disabilities face when using transport (93). People with disabilities can usefully be involved in such training programmes and through the programmes establish valuable communications links with transport staff. Disabled people’s groups also can collaborate with transport managers to set up “secret rider” programmes, in which people with various disabilities travel on transport as passengers to uncover discriminatory practices. Public awareness campaigns are a part of the educational process: posters, for instance, can teach passengers about priority seating.

Barriers to information and communication

Accessible information and communication technology covers the design and supply of information and communication technology products (such as computers and telephones) and services (telephony and television) including web-based and phone-based services (94–98). It relates to the technology – for example, control and navigation, through twisting a knob or clicking a mouse, and to the content – the sounds, images, and language produced and delivered by the technology.

ICT is a complex and fast-growing industry, worth some US$ 3.5 trillion worldwide (99). An increasing number of basic functions of society are organized with and delivered by ICT (100, 101). Computer interfaces are used in many areas of public life – from banking machines to ticket dispensers (102). Automation is often promoted as a cost-saving measure by dispensing with human interfaces, yet this can disadvantage those persons with disabilities – and others – who will always need personal assistance with some tasks (103).

In particular, the Internet is increasingly a channel for conveying information about health, transport, education and many government services. Major employers rely on online application systems for recruitment. Accessing general information online enables people with disabilities to overcome any potential physical, communication and transport barriers in accessing other sources of information. ICT accessibility is therefore needed for people to participate fully in society.

People with disabilities, once they are able to access the web, value the health information and other services provided on it (31). For example, one survey of Internet users with mental health conditions found that 95% used the Internet for diagnostic-specific information, as opposed to 21% of the general population (104). Online communities can be particularly empowering for those with hearing or visual impairments or autistic spectrum conditions (105) because they overcome barriers experienced in face-to-face contact. People with disabilities who are isolated value the Internet in enabling them to interact with others and potentially to conceal their difference (104, 106). For example, in the United Kingdom the state broadcasting company has set up a web site called “Ouch!” for people with disabilities (107) and created special
web materials for people with intellectual impairments.

Future innovations in ICT could benefit people with disabilities and older persons by helping them overcome barriers of mobility, communication, and so on (108). When designing and distributing ICT equipment and services, developers should ensure that people with disabilities gain the same benefits as the wider population and that accessibility is taken into account from the outset.

**Inaccessibility**

Mainstream ICT devices and systems, such as telephones, television, and the Internet, are often incompatible with assistive devices and assistive technology, such as hearing aids or screen readers. Overcoming this requires:

- designing the mainstream features for the widest possible range of user capabilities;
- ensuring the device is adaptable for an even wider range of capabilities;
- ensuring the device can connect with a wide range of user interface devices (109).

People with disabilities should have the same choice in everyday telecommunications as other people – in access, quality, and price (28).

- People with hearing and speech impairments, including the deafblind, need public or personal telephones with audio outputs adjustable in volume and quality, and equipment compatible with hearing aids (28, 110).
- Many people need text telephones or videophones with visual displays of text, or sign language in real-time telephone communications (111). A relay service with an operator is also required, so that users of text telephones and videophones can communicate with users of ordinary voice telephones.
- People who are blind or deafblind and cannot access visual displays at all require other options such as speech and audio and Braille (112). Those with low vision need visual presentations to be adjusted for font type and size, contrast, and use of colours.
- People with dexterity impairments and upper extremity amputees may experience difficulties with devices requiring fine manipulation, such as small keyboards (113). Switch interfaces, alternative keyboards or use of head and eye movement can be possible solutions to access computers.
- To use computers and access the web, some people with disabilities need screen readers, captioning services, and web page design features such as consistent navigation mechanisms (114–116).
- People with cognitive impairments, including age-related changes in memory, and older adults may find the various devices and online services difficult to understand (117–120). Plain language and simple operating instructions are important.

The lack of captioning, audio description and sign language interpretation limit information access for people who are deaf and hearing impaired. In a survey conducted by the World Federation of the Deaf, only 21 of 93 countries were found to provide captioning of current affairs programmes and the proportion of programmes with sign language was very low. In Europe only one tenth of national-language broadcasts of commercial broadcasters were provided with subtitles, only five countries provided programmes with audio description, and only one country had a commercial broadcaster that provided audio description (28). A report on the situation in Asia has found that closed captioning or sign-language interpretation of television news broadcasts is limited (39). Where it is available, it is usually confined to large cities.

Furthermore, television programmes distributed over the Internet are not required to have closed captioning or video description – even if they originally contained captions or description when they were shown on television. As the dissemination of television programmes expands, moving from broadcast to cable and Internet and from analogue to digital, there is greater uncertainty over regulatory
frameworks and whether the same rights to have material subtitled still pertain.

Few public and even fewer commercial web sites are accessible (28, 116, 121). A United Nations “global audit” examined 100 home pages on the web drawn from five sectors in 20 countries. Of these, only three achieved “single-A” status, the most basic level of accessibility (2). A study in 2008 found that five of the most popular social networking sites were not accessible to people with visual impairment (122). Surveys showing that disabled people have a much lower rate of web use than non-disabled people indicate that the barriers are associated with having a visual or dexterity impairment (31). Those who are deaf or have difficulties with mobility do not experience the same barriers, if socioeconomic status is controlled for.

**Lack of regulation**

While many countries have laws covering ICT, the extent to which these cover accessible ICT is not well documented (51, 123). In developed countries, many ICT sectors are not covered by existing legislation. Some important gaps include business web sites, mobile telephony, telecommunications equipment, TV equipment, and self-service terminals (124). Rapid development in ICT often leaves existing regulation outdated – for example, mobile phones often are not covered under legislation on telephony. Furthermore, technological developments and convergence across sectors blur what were previously clear cut distinctions – for example, telephony over the Internet often falls outside the scope of legislation regarding landlines.

Standards for the development of ICT are lagging behind the development of accessibility standards for public accommodations and public transport. A compilation of data on 36 countries and areas in Asia and the Pacific showed that only 8 governments reported that they had accessibility standards or guidelines for ICT while 26 reported to have accessibility standards for either the built environment or public transport or both (51).

From a legislative and policy perspective, sectoral approaches to ICT provide challenges. It may be impractical and inefficient to consider a wide range of sectoral legislation to be developed to address the full spectrum of ICT and their applications. Consistency of standards for the same product or for services across sectors would be more difficult to achieve with this type of vertical approach. Regulating services separately from equipment has also been found unhelpful in ensuring access to all supply chain components – content production, content transmission, and content rendering through end-user equipment (124). A key challenge is influencing decisions in the development of products and services far enough back in the supply chain to guarantee access.

Regulation of television and video does not always keep pace with technology and service developments. For example, video carried on computers and hand-held devices is not always accessible. The United States Telecommunications Act of 1996 regulated “basic” services, such as telephony. But it did not regulate “enhanced” services, such as the Internet. This allowed the Internet to flourish without regulation, neglecting access requirements. With services converging and the distinction between basic and enhanced services steadily eroding, this has left major gaps in regulation (125). One study of United States web designers found that they would make web sites accessible only if the government required them to (126). Deregulation and self-regulation potentially undermine the scope for government action to mandate disabled access (127).

**Cost**

The high cost of many technologies limits access for people with disabilities, particularly in low-income and middle-income countries. In particular, intermediate and assistive technology are often unaffordable or unavailable. For example, a United Kingdom study found that the most common reason for people with disabilities not using the Internet was cost – of
the computer, of online access, and of assistive devices (128). A screen reader such as JAWS can cost US$ 1000 (102), though there are some open source versions, such as the Linux Screen Reader. Internet-based high-speed broadband technology has only made the differences more apparent. While this technology can deliver services that people with disabilities need, such as sign-language videophone, it is often not available, and when available, its cost makes it unaffordable for many (129).

**Pace of technological change**

Assistive technology for accessing ICT quickly becomes obsolete as new technology develops at an increasing rate (130–132). Almost every time new technology is introduced, people with disabilities do not obtain the full benefit (125).

Few ICTs are designed to be inherently accessible. Ways of resolving problems of access in one generation of computer hardware or software do not always carry over to the next generation. Mainstream software upgrades, for instance, make software from the previous generation obsolete – including peripherals, such as the screen readers used by disabled people.

**Addressing the barriers to information and technology**

Given the wide spectrum of ICT products, services, and sectors (commerce, health, education, and so on) a multisectoral and multi-stakeholder approach is required to ensure accessible ICT. Governments, industry and end-users all have a role in increasing accessibility (28, 97, 109, 110, 127, 133, 134). That includes raising awareness of need, adopting legislation and regulations, developing standards and offering training.

An example of a partnership working towards these aims is G3ict, which is a public-private partnership, part of the United Nations Global Alliance for ICT and Development. Among other activities, G3ict is assisting policy-makers around the world to implement the ICT accessibility dimension of the CRPD, with the help of a special “e-accessibility toolkit”. In collaboration with the International Telecommunications Union (ITU), G3ict is also developing the first digital accessibility and inclusion index for people with disabilities. This is a monitoring tool surveying countries that have ratified the CRPD to measure how far they have implemented the digital accessibility provisions defined in it, scoring on 57 data points (135).

Improved ICT accessibility can be achieved by bringing together market regulation and antidiscrimination approaches along with relevant perspectives on consumer protection and public procurement (124). In Australia a complaint from a deaf customer led to a change in the mainstream telecommunications legislation to include a duty on operators to provide necessary equipment under equivalent conditions. Competition, rather than regulation, can also drive improvements. In Japan a civil service magazine runs an “e-city” competition, and different municipalities strive to excel in information and communication categories that include criteria for accessibility (136).

Those producing and providing ICT-based products and services and those deploying ICT products and services have complementary roles in providing accessible ICT (124). Producers and providers can incorporate accessibility features in the products and services they design and sell, and governments, banks, educational institutes, employers, travel agents, and the like can ensure that the products that they procure and use do not present access barriers to employees or customers with disabilities.

**Legislation and legal action**

States that currently address ICT accessibility do so through both bottom-up and top-down legislative approaches as well as non-legislative
mechanisms. Top-down approaches impose direct obligations on those producing ICT products and services, such as close captioning on TVs and relay features to enable people with hearing impairments to use the telephone system. Bottom-up approaches include consumer protection and non-discrimination legislation that explicitly cover the accessibility of ICTs and protect the rights of users and consumers. For example, the Republic of Korea combines both approaches with the 2007 Korea Disability Discrimination Act and the 2009 National Informatization Act, which together provide information access rights and reasonable accommodation.

Evidence from a benchmarking study in Europe showed that countries with strong legislation and follow-up mechanisms tend to achieve higher levels of ICT access (137).

Legislation, such as the United States Television Circuitry Decoder Act, can be a way of ensuring that television manufacturers are required to include technology supporting closed captioning in addition to obliging cable providers to guarantee interoperability between the captioning services and receiver equipment (126). Legislation can also ensure subtitling of programmes. For example, the Danish Act on Radio and Television Broadcasting (2000) creates an obligation for public service television channels to promote access for disabled people, by subtitling (138).

Accessibility to public web sites can be addressed through a broad range of legislation directed towards the equality of persons with disabilities or as part of wider legislation on eGovernment or ICT. Vague antidiscrimination legislation, the main legislative approach for business web sites, is unlikely to be effective. Where legislation exists, regulatory gaps can be addressed through revisions such as the United States 21st Century Communications and Video Accessibility Act and the Federal Communications Commission ruling that Voice Over Internet Protocol (the delivery of voice communications over the Internet which can improve access for visually impaired users) falls under Section 255 of the 1996 Telecommunications Act. The legislative approach can be supported by a range of support measures – awareness-raising, training, monitoring, reporting, providing technical guidelines and standards, and labelling – for providers of public web sites, as in some European countries (124).

Legal challenges under disability discrimination laws have led to improvements in telecommunications service in several countries. In Australia, for instance, the decision in 1995 in Scott and DPI v. Telstra defined telecommunications access as a human right (100). Title IV of the Americans with Disabilities Act directed providers of telephone services to provide relay systems for customers with hearing or speech impairments at no additional cost, and compliance has been very high (126).

Legal action can ensure compliance. In Australia, a landmark legal case involved a man who sued the Organizing Committee of the 2000 Olympic Games in Sydney on the grounds that its web site was not accessible. In response, the Organizing Committee claimed it would be excessively costly to make the required improvements. Even so, the Organizing Committee was found culpable by the Human Rights Equal Opportunities Commission and was fined. In Canada a complaint was filed against Air Canada because of its inaccessible ticketing kiosk. Although this was acknowledged to be a barrier, the Canadian Transport Agency rejected the complaint, because, while it doesn’t comply with universal design principles, a check-in clerk could also issue boarding passes (102).

Where enforcement mechanisms rely on people with disabilities taking legal action, this can be expensive and time-consuming and require considerable knowledge and confidence on the part of plaintiffs. Research is not available to show how many cases are brought, how many succeed, and how the process can be improved (126).
Progress in achieving accessible ICT has been slow despite legislation (see Box 6.6) (103). As previously discussed, both top-down and bottom-up legislation is required. Other approaches, such as financial incentives for the development of accessible technologies and services, might also be fruitful. Further research and information is needed on the types of legislation and other measures that would be most appropriate to reach the various sectors and dimensions of information and communication access across different contexts is needed.

**Standards**

Article 9 of the CRPD calls for the development of universal design and technical standards. Guidelines and standards have generally related to product safety, though ease of use has become more important. Standards
organizations now take greater account of usability factors and stakeholder involvement in developing standards for ICT (127). Designers and manufacturers argue for voluntary standards, claiming that mandatory guidelines could restrict innovation and competition. However, unless enshrined in legislation, there may be limited compliance with standards.

Certification for accessible ICT and labelling are possible supports to improving access. The United States Rehabilitation Act Amendments of 1998 require the Access Board to publish standards for information and communication technology, including technical and functional performance criteria. Because of the size of the American market, effective regulation in the United States can drive accessibility improvements in technologies, which are then reproduced worldwide (see Box 6.6).

Different countries have achieved different levels of access, and not all technologies in developing countries have reached the access available elsewhere (97, 109, 110, 130, 132, 141, 142). Web Content Accessibility Guidelines (WCAG) 1.0 remains the standard in most countries, although there is a shift towards WCAG 2.0. Efforts are under way to harmonise standards – for example, between the United States Section 508 and WCAG 2.0 accessibility requirements (143).

Two important developers of technical standards for accessible ICT products and services are the W3C Web Accessibility Initiative (144, 145) and the DAISY Consortium (146) (see Box 6.7).

Policy and programmes

Government telecommunications policies in several countries have improved in recent years, especially for landline phones. Where sectoral policies exist cross-cutting coordination may be indicated (124). Horizontal approaches may be able to address the barriers inherent in a sectoral approach. Policies on ICT accessibility in Australia, Canada, and the United States have set standards for other countries (28, 147). Sweden uses universal service obligations to ensure that telecommunications operators provide special

**Box 6.7. DAISY (Digital Accessible Information SYstem)**

The DAISY consortium of talking-book libraries is part of the global transition from analogue to digital talking books. The aim of the consortium, launched in 1996, is to make all published information available – in an accessible, feature-rich, and navigable format – to people with print-reading disabilities. This should be done at the same time as, and at no greater cost than, for people who are not disabled. In 2005, for example, *Harry Potter and the Half-Blood Prince* was made available in DAISY format to visually impaired children on the day the story was originally published.

The consortium also works in developing countries on building and improving libraries, training staff, producing software and content in local languages, and creating networks of organizations (141). It also seeks to influence international copyright laws and best practices to further the sharing of materials.

DAISY collaborates with international standards organizations on standards that have the widest adoption around the world and that are open and non-proprietary. It develops tools that can produce usable content, and has intelligent reading systems. DAISY DTBOOK-XML, for instance, is a single-source document for the distribution of several formats such as hard-copy print book, EPUB e-text book, Braille book, talking book, and large-print book.

AMIS (Adaptable Multimedia Information System), available in Afrikaans, Chinese, English, French, Icelandic, Norwegian, and Tamil, is a free, open-source, self-voicing system that can be downloaded from the DAISY site.

In Sri Lanka the Daisy Lanka Foundation is creating 200 local-language and 500 English-language digital talking books, including school curriculum textbooks and university materials. The books, produced by sighted and blind students working in pairs, will be disseminated through schools for the blind and a postal library. This will allow access to a wider range of materials for the blind than currently available in Braille. Local-language talking books will also help those who are illiterate or have low vision.
services for people with disabilities. The Swedish National Post and Telecom Agency also offers speech support for people with speech and language difficulties and discussion groups for deafblind people (148).

While access to television is a fundamental problem for people who are deaf or blind, features to enable access exist (110). Some of these features require technological improvements to equipment – for example enabling closed captioning. Other features require policy decisions by broadcasters – for example, providing sign language interpretation for news programmes or other broadcasts (17, 138). Video services with audio descriptions can make the visual images of media available to those who are blind or who have low vision. Emergency alerts can be communicated by sound and caption. Radio programming is particularly helpful for people who are visually impaired.

Public sector channels are often more easily regulated or persuaded to offer accessible broadcasts (149). In Europe news programmes with sign language interpretation are provided in countries including Ireland, Italy, Finland, and Portugal (138). In Thailand and Viet Nam daily news programmes are broadcast with sign language interpretation or closed captioning. In India a weekly news programme broadcasts in sign language. China, Japan, and the Philippines encourage broadcasters to provide such programming (39). Elsewhere:

- In Colombia public service television is obliged to include closed captioning, subtitles, or sign language.
- In Mexico there exists a requirement for captioning.
- In Australia, where there are captioning requirements for both analogue and digital television, the target for captioning on prime time television is 70% of all programmes broadcast between 18:00 and midnight.

Further progress is possible as illustrated by Japan (Ministry of Internal Affairs and Communications) having set a target of captioning 100% of programmes where captioning is technically possible, for both live and pre-produced programmes, by 2017.

Several countries have initiatives to improve ICT accessibility such as:

- Sri Lanka has several ICT accessibility projects, including improving payphone access for people with disabilities (110).
- In Japan the Ministry of Internal Affairs and Communications (known until 2004 as the Ministry of Public Management, Home Affairs, Posts and Telecommunications) has set up a system to evaluate and correct access problems on web sites. The ministry also helps other government organizations make web sites more accessible for people with disabilities including older persons.
- South Africa has a National Accessibility Portal that can handle many languages. The portal is accessed by computers in service centres with accessible equipment and through a telephone interface (142, 150). The portal serves as a one-stop shop for information, services and communications for people with disabilities, caregivers, the medical profession, and others providing services in the field of disability.

**Procurement**

Procurement policies in the public sector can also promote ICT accessibility (109, 142). Some governments have comprehensive legislation on ICT accessibility, including procurement policies requiring accessible equipment, such as Section 508 of the United States Rehabilitation Act (140, 147, 151). Government procurement policies can create incentives for the industry to adopt technical standards for universally designed technology (35, 97, 132, 134, 152, 153). The European Parliament and other bodies within the European Union have passed resolutions on web accessibility and are harmonizing public procurement policies (124). The European Union included ICT accessibility in its European Action Plan, which also covered
investment in the research and development of accessible ICT and suggested strengthening the provisions on accessibility (151). Tools are available for promoting accessible procurement, for example the Canadian Accessible Procurement Toolkit (154) and the United States Buy Accessible Wizard (155).

**Universal design**

Different people with disabilities prefer different solutions to access barriers, and choice is a key principle in developing accessibility (102).

Accessible telephone handsets for landline phones are increasingly available. In developed countries telecommunications suppliers offer telephone equipment with features including: volume control, a voice-aid facility, large buttons, and visual signal alerts; a range of teletypewriters, including a Braille teletypewriter and one with a large visual display; and adaptors for cochlear implant users.

Access innovations in mobile telephony include:

- Hand-held devices, using mobile phones as platforms, can deliver a range of services, including (156):
  - aids for finding the way for blind people
  - route guidance for people with motor disabilities
  - video sign-language communication for deaf people
  - memory aids for older users and people with cognitive disabilities.
- The “VoiceOver”, a screen reader that “speaks” whatever appears on the display of the “iPhone” mobile device, lets visually impaired users make calls, read e-mail, browse web pages, play music, and run applications (157).
- The cognitive accessibility of mobile phones can be increased for people with intellectual impairments (158). A special phone has been designed for those who find the ordinary mobile device too complicated, with a large back-lit keyboard and simple menus and access options (159).

- In Australia the mobile telephone industry has launched a global information service for reporting the accessibility features of mobile phones (160). Australia and the United States also require that accessible information be provided with telecom equipment.
- Deaf people often use SMS (texting on mobile telephones) for face-to-face as well as long distance communication (161).
- In Japan the Raku Raku phone has been universally designed, with a large screen, dedicated buttons, read aloud menus, voice input text messages, and an integrated DAISY player. More than 8 million have been sold, particularly for the ageing population, previously an untapped market for mobile phone manufacturers (162).

Disabled people’s organizations have called for universal design in computers and the web – a proactive rather than reactive approach to accessible technology (163). For example, screen-reader users often do not like the offer of a “text only” version of web sites, because they are less commonly updated: it is preferable to make the graphic version accessible (164). Raising the Floor proposes a radical new approach: building alternative interface features and services directly into the Internet, so that any users who need accessibility features can invoke the exact features they need on any computer they encounter, anywhere, anytime (165). Accessibility features in such operating systems as Microsoft Windows and Mac OS X already offer basic screen reading facilities, but awareness of those features is sometimes low.

Guidelines for designers and operators of web sites on how to deliver accessible content to hand-held mobile devices are also being produced by W3C (166).

**Action by industry**

There is a strong business case for removing barriers and promoting usability (167). This requires focusing on “pull” factors, rather than the “push”
factor of regulation, as well as challenging myths that accessibility is complex, uncool, expensive, and for the few (168). Accessibility can offer market benefits, particularly with an ageing population. Accessible web sites and services can be easier for all customers to use – hence, the term “electronic curb cuts” (167).

By the end of 2008 the number of mobile phone subscribers reached 4 billion (169). In Africa, for example, the number of mobile telephone users increased from 54 million to almost 350 million between 2003 and 2008 – far in excess of the number of landline users (169). One of the largest mobile providers in China is offering a special SIM card to users with disabilities. The discounted monthly fee of the service and the low charge for text messages makes it affordable for hard-of-hearing or deaf users. Card users can recharge their account by sending a text message. The company also has an audio version of its news service that allows people with visual impairment to listen to news reports (170).

A United Kingdom grocery supplier with an online service has produced an accessible site in close consultation with the Royal National Institute of Blind People and a panel of visually-impaired shoppers (171). The site offers an alternative to the high-graphic content of the mainstream version of the site. Originally designed for visually-impaired users, the site attracts a much wider audience – with many fully sighted people finding the accessible site easier to use than other sites. Spending through the site is £13 million a year, almost 400 times the original cost of £35 000 to develop the accessible site. And as a result of the access improvements, the site, at no extra cost, will be easy to use with personal digital assistants, web TV, and pocket computers with low-speed connections and limited screen sizes.

Recent research on barriers to inclusive design in communications equipment, products, and services – and on ways to address these barriers – suggests areas for improvement (172): better communication with stakeholders; marketing of accessible products and services as an ethical choice; wider access to information and mechanisms for sharing knowledge about the needs of older and disabled people.

Removing operational barriers can also enable companies to benefit from the expertise of disabled workers. For example, major corporations have led the way in ensuring that employees can access assistive technologies and promote ICT accessibility. One company achieved a 40% reduction in bandwidth costs after introducing an accessible intranet solution. Getting disabled access right can enhance reputation, as well as potentially saving costs or improving sales (143).

Role of nongovernmental organizations

Disabled people’s organizations have campaigned for better access to ICT, based on a rights-based approach (102). This has included advocating for more regulation, trying to influence manufacturers and service providers to ensure access, and resorting to legal challenges in cases of non-compliance (127). Active involvement in nongovernmental organizations in oversight and enforcement has been identified as helpful in improving access (124).

Whether through organizations or as individuals, people with disabilities should be involved in the design, development, and implementation of ICTs (102). These steps would reduce costs and widen markets by ensuring that more people can use ICTs from the start (126).

Nongovernmental organizations can also undertake programmes to help persons with disabilities access to ICT – including offering related training to ensure digital literacy and skills. For example, the New Delhi branch of the Indian National Association for the Blind established a computer training and technology centre with accessible and affordable ICT for blind people and has been running initial and
update courses for free since 1993. Courseware was developed in Braille, audio, large-print, and electronic-text formats to cater to people with visual impairment. Projects included developing Braille transcription software, search engines, and text-to-speech software in Hindi. Visually impaired students became trainees at the computer company sponsoring the centre. This model of training is being used in other countries. In Ethiopia the Adaptive Technology Center for the Blind, with support from United Nations Educational, Scientific and Cultural Organization (UNESCO), created a computer training centre for people who are blind or visually impaired to gain skills in the use of ICT and improve their employment opportunities (173).

Conclusion and recommendations
Environments can either disable people with health problems or foster their participation and inclusion in social, economic, political, and cultural life. Improving access to buildings and roads, transportation, and information and communication can create an enabling environment which benefits not only disabled people but many other population groups as well. Negative attitudes are a key environmental factor which needs to be addressed across all domains.

This chapter argues that the prerequisites for progress in accessibility are: creation of a “culture of accessibility;” effective enforcement of laws and regulations; and better information on environments and their accessibility. To succeed, accessibility initiatives need to take into account affordability, availability of technology, knowledge, cultural differences, and the level of development. Solutions that work in technologically sophisticated environments may be ineffective in low-resource settings. The best strategy for achieving accessibility is usually incremental improvement. Initial efforts should focus on removing basic environmental barriers. Once the concept of accessibility has become ingrained, and as more resources become available, it becomes easier to raise standards and attain a higher level of universal design.

Making progress in accessibility requires engagement of international and national actors, including international organizations, national governments, technology and products designers and producers, and persons with disabilities and their organizations. The following recommendations highlight specific measures that can improve accessibility.

Across domains of the environment
- Accessibility policies and standards should meet the needs of all people with disabilities.
- Monitor and evaluate the implementation of accessibility laws and standards. An impartial monitoring body, preferably outside government, and with a significant membership of disabled people, could be designated and funded to track progress on accessibility and recommend improvements.
- Awareness-raising is needed to challenge ignorance and prejudice surrounding disability. Personnel working in public and private services should be trained to treat disabled customers and clients on an equal basis and with respect.
- Professional bodies and educational institutions can introduce accessibility as a component in training curricula in architecture, construction, design, informatics, marketing, and other relevant professions. Policy-makers and those working on behalf of people with disabilities need to be educated about the importance and public benefits of accessibility.
- International organizations can play an important role by:
  - Developing and promoting global accessibility standards for each domain of the physical environment that are widely relevant, taking into account constraints such as cost, heritage, and cultural diversity.
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- Funding development projects that comply with relevant accessibility standards and promote universal design.
- Supporting research to develop an evidence-based set of policies and good practices in accessibility and universal design, with particular emphasis on solutions appropriate in low-income settings.
- Developing indices on accessibility and reliable methods of data collection to measure progress in improving accessibility.

Industry can make important contributions by promoting accessibility and universal design in the early stages of the design and development of products, programmes, and services.

Persons with disabilities and their organizations should be involved in accessibility efforts – for example, in the design and development of policies, products and services to assess the need of users, but also for monitoring progress and responsiveness.

Public accommodations

- **building and roads**
  - Adopt universal design as the conceptual approach for the design of buildings and roads that serve the public.
  - Develop and mandate minimum national standards. Full compliance should be required for new construction of buildings and roads that serve the public. This comprises features such as ramps (curb cuts) and accessible entries; safe crossings across the street; an accessible path of travel to all spaces and access to public amenities, such as toilets. Making older buildings accessible requires flexibility.
  - Enforce laws and regulations by using design reviews and inspections; participatory accessibility audits; and by designating a lead government agency responsible for implementing laws, regulations, and standards.
  - For developing countries a strategic plan with priorities and a series of increasing goals can make the most of limited resources. Policy and standards should be flexible to account for differences between rural and urban areas.

Transportation

- Introduce accessible transportation as part of the overall legislation on disability rights.
- Identify strategies to improve the accessibility of public transport, including:
  - Applying universal design principles in the design and operation of public transport, for example in the selection of new buses and trams or by removing physical barriers when renovating stops and stations.
  - Requiring transportation agencies, in the short-term, to provide STS such as shared vans or accessible taxis.
  - Making public transport systems more flexible for the user by optimizing the use of information technology.
  - Make provisions for alternative forms of transport such as tricycles, wheelchairs, bicycles, and scooters by providing separate lanes and paths.

  Establish continuity of accessibility throughout the travel chain by improving the quality of pavements and roads, pedestrian access, installing ramps (curb cuts), and ensuring access to vehicles.

  To improve affordability of transport, subsidize transport fares for people with disabilities who may not be able to afford them.

  Educate and train all parties involved in transportation: managers need to understand their responsibilities and front-line staff need to ensure customer care. Public awareness campaigns can assist the educational process: posters, for example, can teach passengers about priority seating.

Access standards and universal design innovations implemented in developed countries are not always affordable or appropriate in low-income and middle-income countries.
Country-specific solutions can be found. Low-cost examples include: lower first steps, better interior, and exterior handrails at entrances to buses, priority seating, improved lighting, raised paved loading pads where there are no pavements, and the removal of turnstiles.

**Accessible information and communication**

- Consider a range of bottom-up and top-down legislative and policy mechanisms including: consumer protection, non-discrimination legislation covering information and communication technologies and direct obligations on those developing ICT systems, products, and services.

- In the public and private sector adopt policies on procurement which take into consideration accessibility criteria.

- Support the development of telephone relay, sign language, and Braille services.

- When designing and distributing ICT equipment and services, developers should ensure that people with disabilities gain the same benefits as the wider population.

- Producers and providers should incorporate accessibility features in the products and services they design and sell.

- Support the education and training of persons with disabilities to take advantage of ICT – including training to ensure digital literacy and skills.

**References**

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