Accessibility and Development: environmental accessibility and its implications for inclusive, sustainable and equitable development for all

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Department of Economic and Social Affairs

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Acknowledgements 1/

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* Participants in the United Nations Expert Group Meeting on Building Inclusive Societies and Development through Promotion of Accessible Information and Communication Technologies (ICTs): Emerging issues and trends, organized by DESA in collaboration with the Nippon Foundation and United Nations Information Center, Tokyo, 19 – 21 April 2012[2].

1/ The paper is prepared based on outcome of the two recent United Nations Experts Group Meeting on accessibility issues and re-issued as a resource reference for the High Level Meeting on disability and development and ongoing discussions concerning Post-2015 Development Frameworks and Disability. Unless stated otherwise, the views expressed in this paper are those of the author and do not represent the official position of the United Nations. Products and service marks are presented for reference only and do not constitute endorsement by the United Nations. Product and service names are the property of the respective owner or copy right holder.

[1] http://www.un.org/disabilities/default.asp?navid=46&pid=1596
[2] http://www.un.org/disabilities/default.asp?id=1516

Executive Summary

The paper reviews (a) norms and standards related to accessibility in the built environment, transport systems, and information and communications technologies, and (b) international development policies and programmes with reference to the objectives of sustainability, equity and inclusiveness. The paper notes that environmental accessibility is a major theme in international disability instruments, in the light of its contribution to promoting opportunities for all to participate on the basis of equality in development. Policy concern with accessibility remains, however, elusive in mainstream development strategies, policies and programmes.

The paper proposes that one way to address environmental accessibility as a mainstream development issue is to recognize that environmental accessibility is a global public good, which provides universal benefits, covers multiple groups of countries and all populations. Accessible and usable environments are non-excludable - accessibility benefits all - and non-rivalrous – use by one person does not detract from use by others.

The select review of national and regional experience in promotion and provision of accessible and usable products, services and environments indicates that a considerable and continuously expanding body of knowledge and extensive range of skills is available in countries. The challenge is to promote widely the view that provision of accessible and usable products, services and environments is an investment that benefits all and is reflected in value chains rather than to be viewed as social consumption for targeted populations.

The discussion of environmental accessibility issues and options for the way forward examines the role of policies, structures, technologies, and production and distribution processes. The discussion concludes with a short list of key principles to reinforce accessibility and disability-inclusive concerns in mainstream development.

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I. Introduction

This paper considers accessibility in the context of development. The United Nations General Assembly has long identified "accessibility" as a priority in measures promoting equalization of opportunities for persons with disabilities.[3] A substantial body of data documents the universal benefits that accessible and usable environments provide all populations.[4]

The paper reviews and discusses accessibility in the built environment, transportation systems and public facilities, and in information and communication technologies. Assessments of issues and trends are forward looking and focus on international development agenda for the period beyond 2015, the end point of the period identified by the General Assembly to promote and implement and the Millennium Development Goals. The paper considers options to incorporate environmental accessibility in mainstream development to further achievement of the sustainable, inclusive and equitable development and poverty eradication priorities identified by the General Assembly[5] for all.

The paper uses the concise and pragmatic definition of "accessibility" the Secretary-General presented in his report to the General Assembly on advancement of persons with disabilities:

> "Accessibility refers to provision of 'flexibility' to accommodate each user's needs and preferences."[6]

The paper has three main sections. The first section reviews international norms related to environmental accessibility and advancement of persons with disabilities in development, and examines ways in which accessibility norms and standards have been reflected in international development strategies, policies and programmes, which includes implementation of experiences of both the Millennium Development Goals and outcomes of several international conferences and summits in the economic, social and related fields. The second section reviews selected experiences at national, regional and international levels in design, development and promotion of accessibility technical standards and performance requirements; the review draws upon findings and recommendations of recent United Nations Expert meetings on environmental accessibility and development (organized jointly with the World Bank at Washington, DC, from 28-30 June 2010)[7] and on accessible information and communication technologies (organized jointly with the United Nations Information Center, Tokyo, and the Nippon Foundation, a philanthropic foundation, at Tokyo, from 19-21 April 2012).[8] Concluding sections consider options to promote accessibility in the general systems of society in the context of mainstream development.

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[3] General Assembly resolution 52/82.

[4] Wolfgang F. E. Preiser, and Kroydon H. Smith (eds). *Universal Design Handbook*. Second edition (New York: McGraw-Hill, 2011).

[5] General Assembly resolution 65/10.

[6] Leo Valdes, "Accessibility on the Internet," report to the United Nations (16 June 1998, updated 31 March 2004) available at http://www.un.org/esa/socdev/enable/disacc00.htm, cited in Report of the Secretary-General, "Implementation of the world programme of action concerning disabled persons," (United Nations document (A/54/388/Add.1).

[7] *Report of United Nations Expert Group Meeting on Accessibility: Innovative and cost-effective approaches for inclusive and accessible development* (World Bank Headquarters, Washington, DC, 28 - 30 June 2010) available at http://www.un.org/disabilities/default.asp?id=1516.

[8] *Report of United Nations Expert Meeting on Building Inclusive Societies and Development through Promotion of Accessible Information and Communication Technologies (ICTs); Emerging issues and trends* (Tokyo, Japan, 19 – 21 April 2012) available at http://www.un.org/disabilities/documents/egm2012/final-report.pdf .

II. Norms and standards related to environmental accessibility and development

A. Accessibility as a human right

The premise of this paper is accessibility is an inherent right that benefits all. It is not derived from special legislation; nor is it a concern solely to persons due a condition, for instance disability, or demographic cohort, for instance older persons.

The Preamble to the *Charter* of the United Nations provides normative guidance on accessibility in a broad human rights framework; member States express the determination:

> "…to reaffirm faith in fundamental human rights, in the dignity and worth of the human person, in the equal rights of men and women, …and to promote social progress and better standards of life in larger freedom."[9]

Article 19 of the *Universal Declaration of Human Rights* provides:

> "Everyone has the right to freedom of opinion and expression; this right includes freedom to hold opinions without interference and to seek, receive and impart information and ideas through any media and regardless of frontiers."[10]

Binding normative guidance is provided by the International Covenant on Economic, Social and Cultural Rights: Article 13 provides that States Parties "recognize the right of everyone to education …, agree that education shall be directed to the full development of the human personality and the sense of its dignity… [and] further agree that education shall enable all persons to participate effectively in a free society;" Article 15 provides that States Parties "recognize the right of everyone: (a) [t]o take part in cultural life; (b) [t]o enjoy the benefits of scientific progress and its applications."[11]

The companion International Covenant on Civil and Political Rights provides, in Article 25, that "Every citizen shall have the right and the opportunity… (a) [t]o take part in the conduct of public affairs, directly or through freely chosen representatives; … (c) [t]o have access, on general terms of equality, to public service in his country."[12]

B. Environmental accessibility and advancement of persons with disabilities

Environmental accessibility is a principal theme of the *World Programme of Action concerning Disabled Persons* (A/37/351/Add.1 andAdd.1/Corr.1, annex),[13] which states that accessibility in the general systems of society, such as the physical and cultural environment, housing and transportation, social and health services, educational and work opportunities, cultural and social life, including sports and recreational facilities is essential to furthering its development objective of equalization of opportunities. The *World Programme* states that

[9] *Charter* of the United Nations (San Francisco, 26 June 1945).
[10] General Assembly resolution 217 A (III).
[11] General Assembly resolution 2200 A (XXI).
[12] Ibid.
[13] Available at http://www.un.org/esa/socdev/enable/diswpa00.htm.

achieving its goals of "full participation, and equality" is largely determined by environmental factors and that a person is "handicapped when he or she is denied the opportunities generally available in the community that are necessary for the fundamental elements of living."

Normative and substantive guidance on environmental accessibility is provided in Rule 5 (Accessibility), one of the "Target areas for equal participation" in the United Nations Standard Rules on the Equalization of Opportunities for Persons with Disabilities:[14]

> Rule 5 (Accessibility) provides: "States should recognize the overall importance of accessibility in the process of the equalization of opportunities in all spheres of society. For persons with disabilities of any kind, States should (a) introduce programmes of action to make the physical environment accessible; and (b) undertake measures to provide access to information and communication."

The Convention on the Rights of Persons with Disabilities[15] addresses accessibility in its Preamble and as a specific Article. It also provides guidance on the terms "reasonable accommodation" and "universal design" in its "Definitions" Article, on sign language in its "Freedom of expression and opinion, and access to information" Article, and on accessibility implications for "Living independently" and for "Personal Mobility."

Preamble

> "*The States Parties to the present Convention*,
>
> . . .
>
> "(*v*) *Recognizing* the importance of accessibility to the physical, social, economic and cultural environment, to health and education and to information and communication, in enabling persons with disabilities to fully enjoy all human rights and fundamental freedoms."

Article 2. Definitions

> "For the purposes of the present Convention:
>
> . . .
>
> "Reasonable accommodation" means necessary and appropriate modification and adjustments not imposing a disproportionate or undue burden, where needed in a particular case, to ensure to persons with disabilities the enjoyment or exercise on an equal basis with others of all human rights and fundamental freedoms;
>
> "Universal design" means the design of products, environments, programmes and services to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design. "Universal design" shall not exclude assistive devices for particular groups of persons with disabilities where this is needed.

Article 9. Accessibility

[14] General Assembly resolution 48/96, annex, Chapter II.
[15] General Assembly resolution 61/106, annex.

1. To enable persons with disabilities to live independently and participate fully in all aspects of life, States Parties shall take appropriate measures to ensure to persons with disabilities access, on an equal basis with others, to the physical environment, to transportation, to information and communications, including information and communications technologies and systems, and to other facilities and services open or provided to the public, both in urban and in rural areas. These measures, which shall include the identification and elimination of obstacles and barriers to accessibility, shall apply to, inter alia:

(a) Buildings, roads, transportation and other indoor and outdoor facilities, including schools, housing, medical facilities and workplaces;

(b) Information, communications and other services, including electronic services and emergency services.

2. States Parties shall also take appropriate measures:

(a) To develop, promulgate and monitor the implementation of minimum standards and guidelines for the accessibility of facilities and services open or provided to the public;

(b) To ensure that private entities that offer facilities and services which are open or provided to the public take into account all aspects of accessibility for persons with disabilities;

(c) To provide training for stakeholders on accessibility issues facing persons with disabilities;

(d) To provide in buildings and other facilities open to the public signage in Braille and in easy to read and understand forms;

(e) To provide forms of live assistance and intermediaries, including guides, readers and professional sign language interpreters, to facilitate accessibility to buildings and other facilities open to the public;

(f) To promote other appropriate forms of assistance and support to persons with disabilities to ensure their access to information;

(g) To promote access for persons with disabilities to new information and communications technologies and systems, including the Internet;

(h) To promote the design, development, production and distribution of accessible information and communications technologies and systems at an early stage, so that these technologies and systems become accessible at minimum cost.

Article 19. Living independently and being included in the community

States Parties to the present Convention recognize the equal right of all persons with disabilities to live in the community, with choices equal to others, and shall take effective and appropriate measures to facilitate full enjoyment by persons with disabilities of this right and their full inclusion and participation in the community, including by ensuring that:

(*a*) Persons with disabilities have the opportunity to choose their place of residence and where and with whom they live on an equal basis with others and are not obliged to live in a particular living arrangement;

(*b*) Persons with disabilities have access to a range of in-home, residential and other community support services, including personal assistance necessary to support living and inclusion in the community, and to prevent isolation or segregation from the community;

(*c*) Community services and facilities for the general population are available on an equal basis to persons with disabilities and are responsive to their needs.

Article 20. Personal mobility

States Parties shall take effective measures to ensure personal mobility with the greatest possible independence for persons with disabilities, including by:

(*a*) Facilitating the personal mobility of persons with disabilities in the manner and at the time of their choice, and at affordable cost;

(*b*) Facilitating access by persons with disabilities to quality mobility aids, devices, assistive technologies and forms of live assistance and intermediaries, including by making them available at affordable cost;

(*c*) Providing training in mobility skills to persons with disabilities and to specialist staff working with persons with disabilities;

(*d*) Encouraging entities that produce mobility aids, devices and assistive technologies to take into account all aspects of mobility for persons with disabilities.

Article 21. Freedom of expression and opinion, and access to information

States Parties shall take all appropriate measures to ensure that persons with disabilities can exercise the right to freedom of expression and opinion, including the freedom to seek, receive and impart information and ideas on an equal basis with others and through all forms of communication of their choice, as defined in article 2 of the present Convention, including by:

(a) Providing information intended for the general public to persons with disabilities in accessible formats and technologies appropriate to different kinds of disabilities in a timely manner and without additional cost;

(b) Accepting and facilitating the use of sign languages, Braille, augmentative and alternative communication, and all other accessible means, modes and formats of communication of their choice by persons with disabilities in official interactions;

(c) Urging private entities that provide services to the general public, including through the Internet, to provide information and services in accessible and usable formats for persons with disabilities;

(d) Encouraging the mass media, including providers of information through the Internet, to make their services accessible to persons with disabilities;

(e) Recognizing and promoting the use of sign languages.

Three key issues emerge from this brief review of normative guidance on accessibility: first, the 1982 *World Programme of Action concerning Disabled Persons* identified accessibility in a broad development context, with reference to accessible built environments, transport services and communications and with reference to the general systems of society; second, the 1993 United Nations Standard Rules provided that States take steps to ensure that information and communications services are accessible, which was well before Internet-enabled resources became widely available; and third, the Convention on the Rights of Persons with Disabilities provides that accessibility and usability are important in promoting, protecting, ensuring and enabling full and equal enjoyment of all human rights and fundamental freedoms by persons with disabilities in the context of development.

C. Accessibility in the context of international development

The focus on post-2015 international development agenda is important since the "Millennium Declaration," adopted by the Millennium Summit of the United Nations (resolution 55/2) as a guide for international cooperation in the twenty-first century, did not address advancement of persons with disabilities in the context of development. Moreover, the "Road map for implementation of the Millennium Declaration," (A/56/326), submitted by the Secretary-General to the fifty-sixth session of Assembly, did not consider the role of persons with disabilities as development agents and beneficiaries in furthering the Millennium Development Goals and associated commitments; nor did it address the contributions that environmental accessibility would make to participatory and inclusive Millennium Development Goal implementation processes. At the first five-year review of implementation of the Millennium Declaration in 2005 (A/54/2005), the High-Level Plenary of the General Assembly noted "the need for persons with disabilities to be guaranteed full enjoyment of their rights without discrimination" and affirmed the need to finalize a comprehensive convention on their rights. [16] At the second five-year implementation review of the Millennium Declaration in 2010 (A/64/665), the High-Level Plenary of the General Assembly addressed advancement of persons with disabilities with reference to the poverty eradication and noted the importance of providing "equitable access to economic opportunities and social services" and pursuing "sustained, inclusive and equitable economic growth and sustainable development."[17]

[16] General Assembly resolution 60/1, paragraph 139.
[17] General Assembly resolution 65/1, paragraphs 28 and 70.

In contrast, outcome documents adopted by international conferences and summits organized by the United Nations system in the decade preceding the 2000 Millennium Summit did address advancement of persons with disabilities in their respective areas of substantive concern. These are considered as background for identifying policy options to advance persons with disabilities in mainstream development in the post-2015 period.

In the field of education, the outcome document adopted by the World Conference on Special Needs Education: Access and Quality (Salamanca, Spain, 7-10 June 1994),[18] organised by United Nations Educational, Scientific and Cultural Organization (UNESCO) in cooperation with the Ministry of Education and Science of Spain, provides a framework for action on special needs education. The document proclaims that every child has a fundamental right to an education, that education systems must take into account diversity and that those with special needs must have access to regular schools with an inclusive orientation. Governments which have not already done so are urged to adopt an inclusive education policy, law or both.

Advancement of persons with disabilities was considered by four United Nations conferences and summits in the economic, social and related fields organized during the 1990s:

- The Programme of Action adopted by the International Conference on Population and Development (Cairo, Egypt, 5-13 September 1994)[19] considered the situation of persons with disabilities in a broad rights framework and, inter alia, urged Governments: (a) to consider the needs of persons with disabilities in terms of ethical and human rights dimensions; (b) to develop infrastructure to address the needs of persons with disabilities with regard to education, training and rehabilitation; (c) to promote mechanisms to ensure the rights of persons with disabilities; and (d) to promote systems for the social and economic integration of persons with disabilities.

- The Copenhagen Declaration and Programme of Action adopted by the World Summit on Social Development (Copenhagen, Denmark, 5-12 March 1995) [20] considered advancement of persons with disabilities under each of its priority themes: eradication of poverty, expansion of productive employment and social integration.

- The Beijing Declaration and Platform for Action adopted at the Fourth World Conference on Women (Beijing, China, 4-15 September 1995) [21] addresses the situation of women with disabilities in a broad rights context. Paragraph 32 of the Declaration discusses the importance of eliminating barriers to advancement and participation women with disabilities in development. Chapter IV of the Platform, "Strategic objectives and actions" identifies actions for advancement of women with disabilities with reference to education and training, health, economic participation, human rights, and the girl child.

[18] *Final Report of the World Conference on Special Needs Education: Access and Quality, Salamanca, 7–10 June 1994* (Paris: UNESCO, 1994).
[19] *Report of the International Conference on Population and Development, Cairo, 5-13 September* 1994 (United Nations publication, Sales No. E.95.XIII.18), chap. I, resolution 1, annex.
[20] *Report of the World Summit on Social Development, Copenhagen, 6-12 March 1995* (United Nations publication, Sales No. E.96.IV.8), chap. I, resolution 1, annex I.
[21] *Report of the Fourth World Conference on Women, Beijing, 4-15 September 1995* (United Nations publication, Sales No. E.96.IV.13), chap. I, resolution 1, annexes I and II.

- Accessible shelter and habitat is considered under Commitment A, "Adequate shelter for all," of the Istanbul Declaration on Human Settlements and Habitat Agenda adopted at the United Nations Conference on Human Settlements (Habitat II) (Istanbul Turkey, 3-14 June 1996).[22] Commitment A directs special attention to shelter needs and circumstances of persons with disabilities, and the need for accessible shelter and basic services and facilities to be promoted in ways that are consistent with fundamental human rights norms and standards.

Advancement of persons with disabilities in the context of development was considered by three other international conferences in the economic, social and related fields organised by the United Nations following the Millennium Summit, and by World Summits on the Information Society organized by the International Telecommunications Union.

- The Second World Assembly on Ageing (Madrid, 8-12 April 2002)[23] considered population ageing in the twenty-first century and identified measures to promote development of a society for all ages. The Political Declaration and Madrid International Plan of Action on Ageing, 2002, notes that an unprecedented increase in persons aged 60 and over is projected to occur in the first-half of the twenty-first century, from 600 million to an estimated 2 billion by 2050. The greatest and most rapid increases are expected to take place in developing countries. Since population ageing is associated with observed changes in motor and sensory capacities,[24] the Madrid Plan notes the need to consider policy options to further environmental accessibility for all. The Plan also directs special attention to the role of appropriate social services and safety nets and promotion of opportunities for sustainable livelihoods, which are important for independent living in non-institutional settings (A/52/351, paragraph 59).

- The World Summit on Sustainable Development (Johannesburg, 26 August-4 September 2002) [25] considered poverty eradication, changing consumption and production patterns, and protection and management of the natural resource base for economic and social development and implications for sustainable development of current and future generations, cognizant of the need for human dignity for all. The Plan of Implementation adopted by the World Summit considers the situation of persons with disabilities with reference to "health and sustainable development" (chapter VI). The Plan identifies persons with disabilities as members of a vulnerable group of society, requiring protection from debilitating diseases and special care from the causes of ill health, including environmental causes (paragraph 53).

- The United Nations Conference on Sustainable Development – "Rio+20" (Rio de Janeiro, Brazil, 20-22 June 2012) considered two main themes: (a) building a "green" economy, including sustaining and advancing economic, environmental and social

[22] *Report of the United Nations Conference on Human Settlements (Habitat II), Istanbul, 3-14 June 1996* (United Nations publication, Sales No. E.97.IV.6), chap. I, resolution 1, annex II.
[23] *Report of the Second World Assembly on Ageing. Madrid, 8-12 April 2002* (United Nations document A/CONF.197/9), chap. I, resolution 1, annexes I and II.
[24] Richard W. Pew and Susan B. Van Hemel (eds.), *Technology for Adaptive Aging*. Steering Committee for the Workshop on Technology for Adaptive Aging (Washington, DC: National Academies Press, 2004) p. 1.
[25] *Report of the World Summit on Sustainable Development, Johannesburg, South Africa, 26 August–4 September 2002* (United Nations publication, Sales No. E.03.II.A.1 and corrigendum), chap. I, resolution 1, annex, and resolution 2, annex.

well-being in the context of sustainable development and poverty eradication;[26] and (b) institutional frameworks for sustainable development and options for international cooperation. The Conference outcome, "The Future We Want" [27] addresses advancement of persons with disabilities in several paragraphs, which (1) reaffirm a commitment to respect, protect and promote human rights and fundamental freedoms for all (paragraph 9) and (2) note the importance of participation and access to information in engaging stake holders in promoting sustainable development at all levels (paragraph 43). The outcome does not provide that information should be accessible in formats appropriate for a range of stake holders. The outcome notes that green economy policies in the context of sustainable development and poverty eradication should, among issues, "enhance the welfare … and improve livelihoods and empowerment of the poor and vulnerable groups" including persons with disabilities (paragraph 58 (k)). The outcome does not, however, discuss measures to ensure that empowerment is inclusive, accessible and central to development. The "Framework for action" chapter of the outcome addresses options for "planning and building sustainable cities and urban settlements" (paragraph 135) but does not discuss how integrated planning for shelter, habitat and transportation will provide accessibility with reasonable accommodation. The "Framework for action" stresses the "the need for ensuring equal access to education" for, among others, persons with disabilities (paragraph 229). None of the "sustainable development goals" of the outcome (paragraphs 245-251) addresses the role of accessibility to further their achievement, or the need for progressive removal of barriers so that all can participate on the basis of equality in sustainable development and poverty eradication.

The World Summit on the Information Society (WSIS) was held in two phases, in Geneva, from 10-12 December 2003, and at Tunis, from 16-18 November 2005.[28] The Geneva phase focussed on policy options and steps to establish an "Information Society for all," and the Tunis phase focussed measures to implement the Geneva commitments.

The Geneva Declaration of Principles (2003) noted the challenge of harnessing information and communication technologies to promote the development goals of the Millennium Declaration. The Declaration provides that the "special needs" of older persons and persons with disabilities shall be recognized in building an Information Society for all. The Declaration identifies access to information and knowledge, capacity building, and an enabling environment as key principles in building an Information Society for all, but it does not consider the question of accessible information and communication technologies.

The Tunis Commitment (2005) reaffirmed the "desire and commitment to build a people-centred, inclusive and development-oriented Information Society" and the "universality, indivisibility, interdependence and interrelation of all human rights and fundamental freedoms." The Tunis Summit focused on financial mechanisms to bridge the digital divide, on Internet governance and options for follow-up to plans adopted in Geneva and at Tunis.

[26] World Resources Institute, "What is a 'Green Economy'?" published online 5 April 2011, available at http://www.wri.org/stories/2011/04/qa-what-green-economy.

[27] *Report of the United Nations Conference on Sustainable Development (Rio+20), Rio de Janeiro, Brazil, from 20 to 22 June 2012; The future we want* (United Nations document A/CONF.216/L.1), chaps. I and II.

[28] *World Summit on the Information Society; Outcome Documents; Geneva 2003 - Tunis 2005* (Geneva: International Telecommunications Union, 2005).

The Tunis Commitment refers to "the special needs of marginalized and vulnerable groups of society including migrants, internally displaced persons and refugees, unemployed and underprivileged people, minorities and nomadic people, older persons and persons with disabilities." However, it provides no guidance on ensuring that "inclusive and development-oriented Information Societies" provide accessibility with reasonable accommodation for all.

The Tunis Agenda directs special attention to financial mechanisms, including technology transfers and training, and to Internet governance in implementation and follow up to WSIS outcomes and commitments. Persons with disabilities are viewed as subjects for ICT education and training and as beneficiaries of assistive technologies but not as agents in the development of information societies in their own right.

D. International development policies, strategies and programmes at a crossroads

This brief review of international development experience suggests that translation of normative guidance into practical action and concrete outcomes is best described as a discontinuous function occurring over a number of years: policy commitments to environmental accessibility from the 1990s are absent from outcomes of major international development summits and conferences convened in the twenty-first century. Recovery of equalization of opportunities for all persons with disabilities to participate as both development agents and beneficiaries in the period beyond 2015 will require a revitalized policy commitment to environmental accessibility.

The above review suggests that international development policy is at a crossroads: international instruments in the field of disability address advancement of persons with disabilities in the context of development, but outcomes of major international conferences and summits generally have dealt with the question with reference to the social sectors, focusing on provision of public services, social protection, rehabilitation, and to persons with disabilities as recipients rather than co-determiners and agents of poverty eradication efforts.

The principal source of policy guidance on environmental accessibility remains major disability-specific instruments: The World Programme of Action concerning Disabled Persons, the Standard Rules and the Convention on the Rights of Persons with Disabilities.

The second decade of the twenty-first century did have one interesting policy initiative related to accessibility and sustainable and equitable development: the launch of the "World Urban Campaign"[29] at the fifth session of the World Urban Forum (Rio de Janeiro, 22-26 March 2010) by UN - Habitat (United Nations Human Settlements Programme). The World Urban Campaign is a global coalition of public, private bodies and civil society partners to promote sustainable urbanization by means of integrated, gender-sensitive, accessible and pro-poor approaches to social, economic and environmental sustainability.

However, an observed tendency in global policy reviews is to address accessibility to the general systems of society and participation in mainstream development as a matter to be

[29] *Report of the fifth session of the World Urban Forum*, Rio de Janeiro, Brazil, 22–26 March, 2010, "Launch of the World Urban Campaign" (Annex X), available at http://www.unhabitat.org/categories.asp?catid=584 .

pursued mainly within the framework of the Convention on the Rights of Persons with Disabilities. This begs the question of whether environmental accessibility is appreciated as an investment in sustainable and equitable development for all, or as a mandated social consumption for targeted populations.

E. Accessibility: a global public good

Accessibility benefits all: once provided, none can be excluded from accessible environments for cause – although capacity constraints can result in temporary reductions in services access but not accessibility. The benefit that one person can experience from accessibility in the physical environment and in information and communication technologies does not diminish opportunities for others to enjoy the "ease and flexibility" of using an accessible good or service at national, regional or global levels. Accessibility can thus be identified as a member of the set of "global public goods" and not a defined benefit for a particular group.

The concept of global public good is important to advancing environmental accessibility in the context of mainstream development, since it redefines resource allocation questions from a matter of compliance to investments that contribute to improved societal well-being.

Some brief background may be useful: Professor Paul Samuelson is credited with the concept of a public good, which is discussed in his seminal work on public expenditure theory.[30] Professor Samuelson identified two categories of consumption: (1) private consumption goods, which can be parceled out among different individuals, and (2) collective consumption goods, which all enjoy in common in the sense that each individual's consumption of such a good leads to no subtraction from any other individual's consumption of that good.

Private consumption goods are characterized by individual preferences, voluntary exchanges and response to market forces.

Public goods – collective consumption items in the analysis of Professor Samuelson – are commodities and services with two principal characteristics: (1) non-rivalrous, which means extension of the good or service to others involves zero marginal cost; and consumption of a public good by any one consumer does not reduce quantities available to others; and (2) non-excludable, which means no one can be excluded from or affected by a public good.

The joint consumption and zero marginal cost characteristics of public goods suggest that market mechanisms cannot provide a basis for efficient allocation of resources. Professor Samuelson notes the need to construct social welfare functions to allocate public resources to serve collective purposes.

Some argue that markets can provide appropriate incentives for innovation and efficient production of certain public goods.[31] Internet search is a frequently-cited example of a public good produced and maintained in response to market forces.

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[30] Paul A. Samuelson, "The Pure Theory of Public Expenditure," *The Review of Economics and Statistics*, vol. 36, no. 4. (November 1954), pp. 387-389, available at http://links.jstor.org/sici?sici=0034-6535%28195411%2936%3A4%3C387%3ATPTOPE%3E2.0.CO%3B2-A.

[31] Randall G. Holcombe, "A Theory of the Theory of Public Goods," *Review of Austrian Economics*, Vol. 10. No. 1 (1997), pp. 1-22, available at http://mises.org/journals/rae/pdf/RAE10_1_1.PDF. .

Common examples of national-level public goods include clean air, potable water, public safety and security. In contrast, global public goods, such as knowledge, [32] are not defined by geographical location. One characteristic of a global public good is its "stock externality,"[33] which is to say the impact of the collective good or service accumulates over time and depreciates over time as well. Stock externalities can have long-lasting consequences: positive, for instance in the case of knowledge, and negative, in the case of pollution. The joint demand and externality characteristics of global public goods – as in the case of collective goods - mean that market mechanisms cannot provide an effective or accurate basis to assess their impact over time.[34]

Since global public goods are not defined with reference to a particular location, the question becomes at what level the good or service should be produced, disseminated and maintained. At national level, governments can enact laws and adopt policies that aim to promote general welfare and improved livelihoods, and these also provide the basis to internalize externalities – positive and negative – within national territory. There is no appropriate market mechanism to guide decisions on investments in global collective action.

Under international law, States must agree to accede to international obligations.[35] In the case of accessibility, the international community has adopted and reaffirmed commitments in binding and non-binding international instruments, which are reflected in actions by governments to promote environmental accessibility. Recognizing accessibility as a global public good rather than a compliance issue would afford it a central place in international development policy analyses, budgeting decisions, and implementation management.

That is a challenge, since promoting the disability perspective in mainstream development and policy commitment to participation of persons with disabilities as development agents and beneficiaries on the basis of equality remain elusive objectives in the current international development discourse. But excluding an estimated 10 to 15 per cent of the world's population as development agents and beneficiaries is neither an efficient nor sufficient condition for producing sustainable improvements in levels of living and well being for all.

Recovering equalization of opportunities for development participation by all will involve a shift in focus on environmental accessibility from an issue of compliance and social protection to an essential element in development planning, technology, institutional setting and investment decision making at all levels. As a global public good, this presupposes international commitment, including development finance, to actions that promote progressive removal of barriers of a physical, technological or institutional nature, and the agreement of governments to identify functional requirements for accessible environments, to

[32] Joseph Stiglitz, "Knowledge as a global public good," in *Global Public Goods: International Cooperation in the 21st Century*, Inge Kaul, Isabelle Grunberg, Marc A. Stern (eds.), (New York: Oxford University Press for the United Nations Development Programme, 1999), pp.. 308-325.
[33] William D. Nordhaus, "Paul Samuelson and Global Public Goods," in Michael Szenberg, Lall Ramrattan, and Aron A. Gottesman (eds.), *Samuelsonian Economics and the Twenty-First Century* (New York: Oxford University Press, 2006), pp. 88-98
[34] Samuelson, op. cit.
[35] Professor Nordhaus, op. cit., discusses the "Westphalian" dilemma in producing global public goods: sovereign States have the right to govern within national territory; international obligations can be imposed on sovereign States only with its consent. Production of global public goods, Professor Nordhaus notes, often is characterized by inaction in the absence of appropriate international intergovernmental mechanism that can take action with the agreement of participating States.

develop minimum technical specifications related to those requirements, and to institute systems and procedures to promote, implement and monitor environmental accessibility provisions for all.

When perceived s a compliance issue, accessibility is often viewed as an expense in providing and maintaining facilities and services - or operation by a private enterprise – rather than as a necessary investment in infrastructure that eventually enhances and expands opportunities for all. But there has been a substantial body of normative and substantive guidance on accessibility in the context of development, so the challenge is to realize fundamental shifts in the mental environment[36] to ensure that planning and investment decisions focus on measures that contribute to processes of growth and change that are inclusive, sustainable and equitable for all.

III. Accessibility in policy and practice: select review of issues and trends related to the built environment, transport and public facilities, and to information and communication technologies

A. Introduction

Experience suggests that development, provision and maintenance of accessible goods and services on an efficient and sustainable basis are more complex processes than compliance-based decisions alone. A number of actors are involved – representing public, academic, professional, private and voluntary sectors – in the design, development and provision of goods and services that provide accessibility with "reasonable accommodation" for all. Open markets allow decentralized exercise of individual choice, which provides guidance for investment and production decisions, but markets alone cannot provide optimal conditions for production of "collective consumptions goods" due to their intrinsic nature of joint demand.[37] There is a need for a social welfare function to address joint demand[38] and an appropriate regulatory framework to guide decisions on the respective roles of markets, policy incentives and public investment to promote accessibility to the general systems of society for all.

Environmental accessibility plays a not inconsiderable role in development: an estimated 25 per cent of the world's population can benefit from environmental accessibility measures and progressive removal of barriers to their full and effective participation in social life and development. A recent study by the World Health Organization, in collaboration with the World Bank Group, estimated that as at 2010 there are more than one billion persons

[36] Bill McKibben, "The Mental Environment; where our fate as humans will be decided," *Adbusters*; Whole Brain Catalog, No.90 (July – August 2010).

[37] Samuelson, op. cit., p.p. 388-389.

[38] A social welfare function presents a statement of objectives of a society and can represent prospective patterns of collective choice as to alternative social states. It can reflect social preferences based on individual utility functions or can include cardinal measures of social welfare not aggregated from individual utility functions, such as life expectancy, literacy or per capita income. Professor Abram Bergson is credited for introducing the concept of social welfare function, which he defined with the objective of stating "value judgments required for the derivation of the conditions of maximum economic welfare." See Abram Bergson, "A reformulation of certain aspects of welfare economics," *Quarterly Journal of Economics*, vol. 52, no. 2 (February 1938), pp. 310-34, available at http://links.jstor.org/sici?sici=0033-5533%28193802%2952%3A2%3C310%3AAROCAO%3E2.0.CO%3B2-%23. Professor Amartya Sen discusses the question in terms of social choice theory: "how to arrive at cogent aggregative judgments about society … given the diversity of preferences, concerns and predicaments of different individuals within society?" See Amartya Sen, "The possibility of social choice," *American Economic Review* vol. 89, no. 3 (June 1999), pp. 349-378.

(approximately 15 per cent of the global population) living with disabilities.[39] The Madrid Plan of Action on Ageing (2002) noted that accessibility is an important factor in furthering the goal of a "society for all ages." The United Nations Population Division estimates that as at 2009 there are 737 million persons (slightly more than 10 per cent of the global population) aged 60 and older, and the population of older persons (age 60 and above) is growing faster than the total population in most regions.[40]

While accessibility is identified as one of the "General Principles" (Article 4) of the Convention on the Rights of Persons with Disabilities, the Convention does not provide a definition for "accessibility" either in Article 4 or in Article 9, which discusses accessibility measures in detail. Nor is accessibility defined in the World Programme of Action or in the Standard Rules, which suggests usage as an undefined term, like "set" or "number."

The interplay between international norms and standards in the field of disability and developments in national policy, law and administrative guidance, particularly as this pertains to provision of social and rehabilitation services, public accommodation and prevention of discrimination due to a condition or functional limitation, drives much research, development, testing and dissemination of accessibility standards and technical guidelines.

The international policy framework on advancement of persons with disabilities in the context of development provides normative guidance on issues, trends and priorities for actions that governments, which have not already done so, can use in formulating strategies and policy options concerning persons with disabilities. Global comparative studies on development policy and practice concerning persons with disabilities have contributed to the fundamental shift in programmatic focus from the "medical model" of care, rehabilitation and social services to assist persons with disabilities "adapt" to "normal" society to emergence of concern with developmental approaches to disability and priority accorded to accessibility to the general systems of society in realizing the goals of full participation and equality.

Equally important is the contribution of Universal Design concepts and principles in promoting accessible, functional and usable solutions for all. This has moved accessible design discourse beyond a concern with provision of accessibility in the public arena for specific groups to consideration of options that reduce barriers to choice and use and produce solutions that are intuitive, easy to use and require minimum effort for all to enjoy in a range of environments – public and private – and in services and consumer goods. Universal design is not a style but an orientation to design. It is based on the premise that design processes must be inclusive, produce equitable benefits, and be appropriate to human functioning, gender, demographic group and social, economic and cultural settings and

[39] World Health Organization and the World Bank Group, *World report on disability 2011* (Geneva: World Health Organization, 2011), p.29.
WHO produced the estimate using data from its *World Health Survey* and *Global Burden of Disease, 2004 update*. Using 2004 data, the latest year for which data are available from surveys and burden of disease estimates, the *World Health Survey* and *Global Burden of Disease* provide global prevalence of disability estimates among the adult population (age 15 and older) of 15.6% and 19.4% respectively. Based on 2010 population estimates − 6.9 billion, with 5.04 billion 15 years and over and 1.86 billion under 15 years − and the 2004 disability prevalence estimates (*World Health Survey* and *Global Burden of Disease*) there were estimated to be about 785 (15.6%) to 975 (19.4%) million persons 15 years and older living with disability.

[40] United Nations. Department of Economic and Social Affairs, *World Population Ageing 2009* (United Nations publication, ST/ESA/SER.A/295, 2010) p. 11.
United Nations estimate that for the period 2005-2010 the population of older persons is increasing at 2.6 per cent annually while the total population is increasing at 1.2 per cent annually.

historical development experience.[41] A United Nations expert meeting identified a set of universal design principles appropriate to countries:

(a) Equitable use: the design is useful and relevant to a wide group of users;

(b) Flexibility in use: the design accommodates a wide range of individual preferences and abilities;

(c) Simple and intuitive use: the design is easy to understand regardless of the knowledge, experience, language skills or concentration level of the user;

(d) Perceptive information: the design communicates information effectively to the user regardless of the ambient condition or the sensory abilities of the user;

(e) Tolerance for error: the design minimizes the hazards and adverse consequences of unintended actions by the user;

(f) Low physical effort: the design can be used easily, efficiently and comfortably with a minimum of fatigue;

(g) Size and space: the size and space for approach, reach, manipulation and use should be appropriate regardless of the body size, posture or mobility of the user.[42]

The Convention on the Rights of Persons with Disabilities recognizes Universal Design as both a defined term and as a General Obligation of State parties.

> Article 2 provides: "'Universal design'" means the design of products, environments, programmes and services to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design. "Universal design" shall not exclude assistive devices for particular groups of persons with disabilities where this is needed."
>
> Article 4 (f) provides that State parties are obliged: "To undertake or promote research and development of universally designed goods, services, equipment and facilities, as defined in article 2 of the present Convention, which should require the minimum possible adaptation and the least cost to meet the specific needs of a person with disabilities, to promote their availability and use, and to promote universal design in the development of standards and guidelines."

[41] It [Universal Design] is a sensible and economical way to reconcile the artistic integrity of a design with human needs in the environment. Solutions which result in no additional cost and no noticeable change in appearance can come about from knowledge about people, simple planning, and careful selection of conventional products, in Ronald Mace, Graeme Hardie, Jaine Place," Accessible Environments: toward universal design." In Wolfgang F. E. Preiser, Jacqueline Vischer, Edward T. White, eds. (1991). *Design Interventions: toward a more humane architecture* (New York: Van Nostrand Reinhold).

[42] *Report of the International Seminar on Environmental Accessibility, Beirut, 30 November - 3 December 1999* (Beirut: E/ESCWA/HS/2000/1), p. 4.
See also Ronald L. Mace, "Principles of Universal Design" (University of North Carolina at Raleigh: Universal Design Institute, 1997) available at http://udinstitute.org/principles.php.

Much national legislation on environmental accessibility was enacted before the Convention entered into force and is based on national policies on non-discrimination, promotion and protection of rights and fundamental freedoms, and provision of specialized services to persons with disabilities. Environmental accessibility in the context of development generally has focused on technical guidance and performance standards related to accessible transportation, urban infrastructure and public facilities.

The Convention on the Rights of Persons with Disabilities, article 9 (Accessibility) in particular, is a game changing event in a policy and planning sense: State parties are obliged to promote environmental accessibility in mainstream development; accessibility is presented as a right; but provision of accessibility is not merely as a matter of compliance, it benefits all in general population and matters inclusive and sustainable development.

B. Review of accessibility in the built environment, transport, and public facilities

Prior to the Convention, design and development of accessibility guidelines and issuance of technical standards generally was initiated in connection with national legislation mandating accessibility in public facilities and services, public accommodations and government-funded infrastructure. However, designs that aimed to comply with legal provisions on accessibility often would result in solutions that placed "accessible" facilities separate – and thus unequal - from principal service facilities and entryways. This was especially the case in requirements to retrofit existing facilities to meet contemporary standards on accessibility and usability.

Moving from a compliance mode to viewing accessibility as a global public good would encourage solutions that are holistic, provide accessibility with reasonable accommodation[43] and are sustainable. These issues will be considered in the select review of current practices. The focus is on examples that provide benchmarks for specifying functional requirements and defining minimum standards to assist the 108 governments that have ratified the Convention on the Rights of Persons with Disabilities, as at December 2011, but have not yet instituted measures and guidelines to promote and implement its accessibility provisions for the built environment, transport services, public facilities and safe and secure pedestrian movement.

Participants of the United Nations expert meeting on environmental accessibility (2010) noted two approaches[44] to formulating accessibility norms and standards for the built environment and transportation, noting the urgency of the task with the growing list of State parties to the Convention: a top-down or a bottom-up approach.

1. Top-down approaches to accessible environments

[43] "Reasonable accommodation" means necessary and appropriate modification and adjustments not imposing a disproportionate or undue burden, where needed in a particular case, to ensure to persons with disabilities the enjoyment or exercise on an equal basis with others of all human rights and fundamental freedoms" (Article 2 Definitions, Convention on the Rights of Persons with Disabilities).

[44] Tom Rickert, "Background note and policy analysis," paper contributed to *United Nations Expert Meeting on Accessibility* (World Bank, Washington DC, 28-30 June 2010). Available at http://www.un.org/disabilities/default.asp?id=1537.

A "top down" approach views the Convention as a resource for guiding national legislation on accessibility, which would be supplemented by regulations and timelines for implementation, including formulation of norms, standards and specification of benchmarks to carry out required activities at local and sub-national levels. An UN Expert Group Meeting participants cited Brazil, for urban mobility,[45] and South Africa, for accessible built environments,[46] as good examples of developing country experience, albeit with certain modifications due to promulgation of national legislation prior to their signing and ratifying the Convention. The South African Human Rights Commission noted, "Regulations for the built environment cannot remain static. They must not only respond to legislative and policy changes but also allow for innovation in the construction and building industries." [47]

Meeting participants indentified four well-documented experiences of top-down approaches to environmental accessibility in developed countries:

1. Australia

    a. Built environment. Environmental accessibility legislation is based up the *Disability Discrimination Act 1992* (DDA),[48] which provides for elimination, as far as possible, discrimination against persons on the basis of their disabilities in various areas, and in particular access to premises, work, accommodation and the provision of facilities, services and land. The Disability (Access to Premises - Buildings) Standards 2010 (Premises Standards Act),[49] which entered into force in May 2011, aim to ensure that

[45] Brazil Federal Law # 10.048 of 11/08/2000 gives priority to servicing of people it specifies and establishes other measures , and Law # 10.098 of 12/19/2000 establishes general norms and basic criteria for the promotion of accessibility to people with functional limitations or with impaired mobility and establishes other measures. The National Secretariat for Transport and Urban Mobility of the Ministry of Cities, established in January 2003, has developed and is implementing the Brazilian Urban Accessibility Program – Accessible Brazil - to stimulate and support city and state governments to ensure accessibility for people with functional limitations or mobility restrictions to access transport systems, urban equipment and to circulate in public areas. See Renato Boareto, "The Brazilian Urban Accessibility Program of the Ministry of Cities – 'Brazil Accessible,'" paper presented at 11th International Conference on Mobility and Transport for Elderly and Disabled Persons (TRANSED) (Montréal, Québec18-22 June 2007). Available at http://www.tc.gc.ca/eng/policy/transed2007-pages-1112-409.htm .

[46] In South Africa legislative framework governing the built environment has three interdependent mechanisms: The National Building Regulations; the Building Standards Act; and the South African Bureau of Standards (SABS) 0400 Code of Practice.

o The **Building Standards Act** (Act 103 of 1977), last amended in 1989, is the enabling Act under which the National Building Regulations are made. It provides a framework within which the Regulations can be administered, monitored and enforced. The Act and Regulations must therefore be read together.

o The **National Building Regulations**, made by the Minister of Public Works in terms of Section 17(1) of the Building Standards Act, aim to ensure that buildings are designed and built to be safe, healthy and convenient for users.

o The **SABS 0400 Code of Practice** is a non-statutory set of guidelines giving technical information for the practical application of the National Building Regulations. The legislation governing accessibility of the built environment has primarily relied on the application of one aspect of the Regulations, Part S, which was introduced in 1985 to address the needs of people with disabilities. In South African Human Rights Commission (2002). *Towards a barrier-free society* (Johannesburg, November), p. 37, available at www.info.gov.za/view/DownloadFileAction?id=70265.

[47] Ibid.

[48] Available at http://www.comlaw.gov.au/Details/C2011C00747 .

[49] Available at http://www.comlaw.gov.au/Details/F2010L00668. See also the "Access to Premises" resource page of the Australian Human Rights Commission available at http://www.hreoc.gov.au/disability_rights/buildings/access_to_premises.html .

buildings are accessible to people with disability and meet the requirements of discrimination law (DDA). It is envisaged the Standards will ensure buildings in Australia become more accessible and useful to an ageing population as well. Premises Standards prescribe national requirements for new buildings and where new building work is undertaken in existing buildings to comply with DDA in these areas and for the buildings covered by these Standards.

b. Transportation. The Disability Standards for Accessible Public Transport 2002 (as amended 2010)[50] were enacted to provide transport operators and providers with information on their obligations under discrimination law DDA. Providers and operators of public transport must comply with the minimum accessibility requirements set out in the Transport Standards for the full range of public transport vehicles, infrastructure supporting public transport, and premises. New public transport systems must comply with the Standards, and existing public transport must progressively become accessible over a 30 year period. Transport Standards apply to (1) trams, (2) trains, (3) buses and coaches, (4) taxis, (5) ferries, and (6) airplanes.[51]

2. Canada

a. Built environment. The *National Building Code (2010)*[52] is the model building code, issued by the Canadian Institute for Research in Construction,[53] provides the base document for provincial building codes, since provinces are responsible for regulating construction under the Constitution of Canada, Provinces can adopt supplemental legislation or administrative guidance to the Code better to meet local conditions.

b. Transportation. The Canada Transportation Act (1996)[54] states "… a competitive, economic and efficient national transportation system... (is, inter alia) most likely to be achieved when the transportation system is accessible without undue obstacle to the mobility of persons, including persons with disabilities." The Canadian Transportation Agency[55] is responsible for removing undue obstacles to mobility of persons with disabilities from federally-regulated (air, rail, marine and interprovincial bus) transportation services and facilities. This is done by (1) developing regulations, codes of practice and standards,[56] (2) communicating with the transportation industry and community of persons with disabilities, (3) resolving individual accessibility-related complaints, and (4) ordering corrective measures as required.

3. United Kingdom of Great Britain and Northern Ireland

[50] Available at http://www.comlaw.gov.au/Details/F2011C00213
[51] Transport accessibility resource page of the Australian Human Rights Commission available at http://www.hreoc.gov.au/disability_rights/transport/transport.html.
[52] Available at http://www.nrc-cnrc.gc.ca/eng/ibp/irc/codes/2010-national-building-code.html.
[53] Available at http://www.nrc-cnrc.gc.ca/eng/ibp/irc.html.
[54] Consolidated text available at http://www.tc.gc.ca/eng/acts-regulations/acts-1996c10.htm#text.
[55] Available at http://www.cta.gc.ca/eng/accessible-transportation.
[56] Personnel Training for the Assistance of Persons with Disabilities Regulations (SOR/94-42). Available at http://laws-lois.justice.gc.ca/eng/regulations/SOR-94-42/index.html.

a. Built environment. The Disability and the Equality Act 2010[57] aims to protect persons with disabilities and prevent disability discrimination. It provides legal rights for persons with disabilities in several areas, including access to goods, services and facilities, including larger private clubs, and land-based transport services.

Accessibility in the built environment in England and Wales is governed by the Building Regulations, which are enacted – and revised periodically - by government pursuant to the Building Act 1984. Regulations comprise a series of requirements for specific purposes, such as health and safety, energy conservation, prevention of contamination of water and the welfare and convenience of persons in or about buildings. Part M [58] of the regulations sets minimum legal standards for access and use of buildings by all building users, including persons with disabilities.

Accessibility requirements in Scotland are integrated into general Technical Standards[59] and apply to new buildings; conversions; extensions to existing buildings; and parts of a building that are altered or adversely affected by an alteration being carried out elsewhere in the building.

In Northern Ireland, Part R of the Building Regulations (Northern Ireland) 2000, Access to and Use of Buildings[60] aims to ensure new buildings meet reasonable standards of accessibility and to secure cost-effective improvements to the accessibility of the existing building stock when certain building work is carried out. Implementation of Part R is supported by DFP [Northern Ireland Department of Finance and Personnel] Technical Booklet R: 2006 - Access to and use of buildings.[61]

BSI, the National Standards Body for the United Kingdom, published in 2009 BS 8300: 2009 *Design of buildings and their approaches to meet the needs of disabled people - Code of Practice*,[62] which provides guidance in the design of new buildings to make them more accessible; and recommendations can be applied to existing buildings their improved accessibility and usability. BS 8300: 2009 is applicable to a wide range of public buildings and offers recommendations on accessibility of features both around and within a building, including: access to lifts, wall surfaces, signage, wheelchair spaces in audience seating, arrangement of seating, reading carrels in libraries and accessible washbasins. Recommendations address a wide range of disabilities and consider usage by persons with

[57] Government Equalities Office home page available at http://www.homeoffice.gov.uk/equalities/equality-act/.
[58] Part M: Access to and use of buildings - Means of access, sanitary conveniences and audience or spectator seating. Available at http://www.wigan.gov.uk/Services/Planning/BuildingControl/PartMBuildingRegulations.htm.
[59] Scottish Building Standards provide technical guidance to ensure buildings are safe, efficient and sustainable for all. Available at http://www.scotland.gov.uk/Topics/Built-Environment/Building/Building-standards
[60] Available at http://www.dfpni.gov.uk/building_regulations__ni__2000_-_amendment_to_part_r_-_final_ria.pdf
[61] Available at http://www.dfpni.gov.uk/technical_booklet_r_2006-2.pdf .
[62] Available at http://www.bsigroup.com/en/About-BSI/News-Room/BSI-News-Content/Sectors/Construction--Building/BS-8300-publication/.

disabilities as residents, visitors, spectators, customers, employees, or participants in sports events, performances and conferences.

b. Transportation. The Department of Transportation undertakes a number of programmes to improve both transport provision for persons with disabilities, as pedestrians, public and special transport users, or motorists, and accessibility in public places. Part V of the Disability Discrimination Act 2010 covers accessible public transport.[63] The Equality Act 2010 requires all railway station operators to take reasonable steps to ensure they do not discriminate against persons with disabilities and provide reasonable access. The Department of Transport issued in November 2011 *Accessible train and station design for disabled people; a code of practice*,[64] which incorporates relevant changes in BS8300: 2009.

4. United States of America

The United States Access Board is an independent Federal agency, created in 1973, to promote accessibility for people with disabilities, with an initial mandate to ensure access to federally funded facilities. It now is a leading source of information on accessible design. Two of the principal legal instruments that guide its activities, subject to periodic amendment to reflect changing circumstances and conditions, are the *Rehabilitation Act of 1973*,[65] which prohibits discrimination on the basis of disability in programs conducted by Federal agencies, in programs receiving Federal financial assistance, in Federal employment, and in the employment practices of Federal contractors; and the *Americans with Disabilities Act of 1990* as amended,[66] which prohibits discrimination on the basis of disability in employment, State and local government, public accommodations, commercial facilities, transportation, and telecommunications. The Access Board has issued – or currently is developing – guidelines, regulations and standards that address information and communication technologies, construction and modification of public accommodations and public and private facilities, transportation services and facilities, and medical diagnostic equipment. Public facilities and transportation guidelines are reviewed below.

a. Facilities: Accessibility in the built environment is covered by the Americans with Disabilities Act of 1990 (ADA) as amended and the Architectural Barriers Act of 1968 (ABA) as amended.[67]

ADA standards govern construction and alteration of places of public accommodation, commercial facilities, and state and local government

[63] Available at http://www.legislation.gov.uk/ukpga/1995/50/part/V.
[64] Available at http://assets.dft.gov.uk/publications/accessible-train-station-design/accessible-train-station-design-cop.pdf.
[65] Public Law 93-112 93rd Congress, H. R. 8070 September 26, 1973 available at http://www.dotcr.ost.dot.gov/Documents/ycr/REHABACT.HTM. The Act has been subject to frequent amendment, for instance Section 508 on information and communication technologies; see http://www.section508.gov/index.cfm?fuseAction=Laws.
[66] P.L. 110-325 available at http://www.ada.gov/pubs/adastatute08.htm.
[67] Available at http://www.access-board.gov/about/laws/ABA.htm.

facilities;[68] and separate standards, developed in cooperation with the U.S. Department of Transportation, address construction and alteration of transportation facilities covered by the Americans with Disabilities Act.[69]

US Federal facilities are covered by standards consistent with those of the ADA issued under the Architectural Barriers Act (ABA).[70]

b. Transportation: Accessible transportation services and facilities are covered by ADA provisions. ADA Accessibility Guidelines for Transportation Vehicles [71] establish design requirements for (1) buses, vans and related systems, (2) rapid rail vehicles and systems, (3) light rail vehicles and systems, (4) commuter rail cars and systems, (5) intercity rail cars and systems, (6) over-the-road buses and systems, (7) other vehicles and systems, such as trams, monorails and similar vehicles.

ADA Standards for Transportation Facilities are subject to periodic revision in the light changing transport technologies. A recent amendment by the U.S. Department of Transportation, which came in to force in October 2011, provides that new and altered station platforms for high speed rail services ensure that passengers with disabilities can enter and exit any accessible car of the train: "Transportation for Individuals with Disabilities at Intercity, Commuter, and High Speed Passenger Railroad Station Platforms.[72]

2. Bottom-up approaches and local initiative in promoting accessible environments

Participants at the 2010 expert meeting cited the experience of urban accessibility planning in Wuhan, China, assisted by the World Bank,[73] as a well-documented case of a "bottom up" approach to accessibility regulation, formulation of technical guidelines and standards, and rapid prototyping of accessible design solutions. Bottom-up approaches are characterized by local initiative in identifying functional requirements and minimum accessibility standards appropriate to local conditions and capacities, and in developing frameworks to formulate and implement regulatory guidance, implementation and monitoring that are effective and sustainable. Participants noted that local initiatives can provide important lessons in what is needed and in what can be achieved to promote environmental accessibility on a larger scale.

[68] 2010 ADA Standards for Accessible Design available at http://www.ada.gov/regs2010/2010ADAStandards/2010ADAstandards.htm.
[69] ADA Standards for Transportation Facilities available at http://www.access-board.gov/ada-aba/ada-standards-dot.cfm .
[70] ABA Accessibility Standard for Federal Facilities available at http://www.access-board.gov/ada-aba/aba-standards-gsa.cfm.
[71] Available at http://www.access-board.gov/transit/html/vguide.htm.
[72] Available at http://fta.dot.gov/documents/2011-23576.pdf.
[73] *Urban accessibility planning support systems with a case study in Wuhan, China* (2011). Report Number 65620 (Washington DC: World Bank). Available at http://www.worldbank.org/research/2011/11/15479737/urban-accessibility-planning-support-systems-case-study-wuhan-china# .

In the period before the Convention entered into force (in 2008) a number of bottom up approaches to environmental accessibility, many assisted by the United Nations, were undertaken in response to policy guidance provided by the United Nations Standard Rules.

1. Beirut, Republic of Lebanon. Accessible planning and redevelopment of Beirut, Lebanon following a period of civil conflict, was carried out by the Ministry of Social Affairs of the Republic of Lebanon, National Committee for the Disabled, and Solidere - Lebanese Company for the Development and Reconstruction of Beirut City, with technical assistance from the United Nations Economic and Social Commission for Western Asia. The monograph, *Accessibility for the Disabled: a design manual for a barrier-free environment* (Beirut: Solidere, 1998), discusses the two-track approach to promoting non-handicapping environments in the context of urban redevelopment: (a) measures to influence planning, design and reconstruction of a barrier-free Beirut Central District, and (b) technical documentation on accessibility concepts and standards, and suggested instruments to apply and effect wider geographical coverage and social impact throughout Lebanon.[74]

2. Asia and Pacific Region. Pilot action in accessible urban planning and pedestrian movement at national and local levels was undertaken during the first Asian and Pacific Decade of Disabled Persons, 1993-2002[75] in cooperation with interested governments, civil society organizations and professional societies, with technical assistance of the United Nations Economic and Social Commission for Asia and the Pacific, represented by its Social Development Division, in collaboration with the UN ESCAP/United Nations Centre for Human Settlements (HABITAT) Joint Section on Human Settlements, Rural and Urban Development Division. The experiences were compiled in a monograph that discusses concepts, planning and design principles, technical guidelines and implementation strategies, *Promotion of Non-Handicapping Physical Environments for Disabled Persons: guidelines* (Bangkok, 1995).[76]

3. Comparative study of Universal Design in practice

Participants at the 2010 United Nations expert meeting cited a recent global comparative study on building codes and standards and Universal Design, *International Best Practices in Universal Design: a global review*,[77] published by the Canadian Human Rights Commission as a useful compilation of issues and trends related to environmental accessibility. The study examined regulatory and code experience from Africa, the Americas, Asia, Europe, Latin America and Western Asia. It found some countries issued separate documents for specific accessibility requirements in built environments; others integrated accessibility requirements into a national building code; some enacted accessibility requirements that pertain only to particular jurisdictions.

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[74] The experience was considered by a United Nations seminar and workshop; see *International Seminar on Environmental Accessibility; planning and design of accessible urban development in developing countries* (Beirut, 30 November - 3 December 1999). Available at http://www.un.org/esa/socdev/enable/disisea.htm . The *Manual* is available online in accessible HTML at http://www.un.org/esa/socdev/enable/designm/.

[75] *Promotion of Non-Handicapping Physical Environments for Disabled Persons: case studies* (1995). United Nations publication ST/ESCAP/1510. Available at www.dinf.ne.jp/doc/english/intl/z15/z15008cs/z1500801.html.

[76] United Nations publication, ST/ESCAP/1492. Available at www.unescap.org/esid/psis/disability/decade/.../z1500901.htm .

[77] Canadian Human Rights Commission (2006). *International Best Practices in Universal Design; a global review* (Revised edition, 2007) (Ottawa). Available at http://www.chrc-ccdp.ca/pdf/bestpractices_en.pdf.

The codes and standards considered by the review are listed below; online resources and updated codes and standards, if available, are listed in a footnote:

Australia. Council of Standards Australia, Committee ME/64 – Access for People with Disabilities (2001). Design for Access and Mobility; Part 1: General Requirements for access – New Building Work. AS 1428.1 – 2001. Sydney: Standards Australia.

_____. Council of Standards Australia, Committee ME/64 – Access For People with Disabilities (1992). Design for Access and Mobility; Part 2: Enhanced and additional requirements – Buildings and facilities. AS 1428.2 – 1992. Sydney: Standards Australia.

Bangladesh. Housing and Building Research Institute, and Bangladesh Standards and Testing Institute (2003). Bangladesh National Building Code. Dhaka: Housing and Building Research Institute and Bangladesh Standards and Testing Institute.[78]

Canada. Canadian Commission on Building and Fire Codes (1995). National Building Code of Canada, (2004 revision). Ottawa: National Research Council.

_____. Canadian Standards Association (2004). CAN/CSA B651-04, Accessible Design for the Built Environment. Mississauga, Ontario.

_____. Designable Environments (2001). Accessible Facilities Guidelines. London, Ontario.

Ireland. Minister for the Environment, Heritage and Local Government (2000). Building Regulations: Technical Guidance Document M– Access for People with Disabilities. Dublin, Stationary Office.[79]

Lebanon. Urban Management Department, Lebanese Company for the Development and Reconstruction of Beirut Central District (SOLIDERE) (1999). Accessibility for the Disabled: a design manual for a barrier free environment. (Prepared by SOLIDERE in collaboration with the United Nations Economic and Social Commission for Western Asia, with the approval of the Ministry of Social Affairs, and the National Committee for the Disabled). Beirut.[80]

Malaysia. Standards and Industrial Research Institute of Malaysia (1991). Malaysian Standard: Code of Practice for Access for Disabled People to Public Buildings (MS1184:1991). Selangor Darul Ehsan.

México. Oficina de Representación para la Promoción e Integración Social para Personas con Discapacidad, de la Presidencia de la República (2001). Recomendaciones de Accesibilidad. México, D.F.

[78] The *Bangladesh National Building Code* was updated as at 2006 and is available at http://iisee.kenken.go.jp/worldlist/06_Bangladesh/6_Bungladesh_Overall.pdf .
[79] Available at http://www.environ.ie/en/Publications/DevelopmentandHousing/BuildingStandards/FileDownLoad,1655,en.pdf
[80] Available at http://www.un.org/esa/socdev/enable/designm/index.html.

Philippines. Department of Public Works and Highways, Department of Transportation and Communications and National Council for the Welfare of Disabled Persons (1982). Implementing Rules and Regulations as Amended of *Batas Pambansa Bilang* 344 (Accessibility Law): An Act to Enhance the Mobility of Disabled Persons by Requiring Certain Buildings, Institutions, Establishments, and Other Public Utilities To Install Facilities and Other Devices. Quezon City, Metro Manila: Department of Public Works and Highways and the Department of Transportation and Communications.

Singapore. Building Plan Department, Building and Construction Authority (2002). Code on Barrier-Free Accessibility in Buildings (ver. 1.0). Singapore.[81]

Spain. Dirección General de la Vivienda, la Arquitectura y el Urbanismo (2001). Guía técnica de accesibilidad en la edificación 2001. Madrid: Miniterio de Fomento, Centro de Publicaciones.

South Africa. Council of the South African Bureau of Standards (1993). South Africa Standard – Code of Practice – Accessibility of buildings to disabled persons, SABS 0246 Edition 1. Pretoria.

_____. Council of the South African Bureau of Standards (1990). South African Standard – Code of Practice for the Application of the National Building Regulations, SABS 0400-1990. (First revision). Pretoria.

Sweden. Swedish Board of Housing, Building and Planning (Boverket) (2005), Building Regulations; mandatory provisions and general recommendations. [82] *Boverkets byggregler (föreskrifter och allmänna råd). Föreskrifter till plan– och bygglagen (1987:10), Lagen (1994:847) om tekniska egenskapskrav på byggnadsverk, m.m., Förordningen (1994:1215) om tekniska egenskapskrav på byggnadsverk, m.m., Förordningen (1993:1598) om hissar och vissa andra motordrivna anordningar*. BFS 1993:57, BBR 94:1. Ändrad I, BFS 2005:17. Karlskrona: Boverket.

_____. Swedish Board of Housing, Building and Planning (Boverket) (2003). Removal of easily eliminated obstacles (code of statutes).[83] *Boverkets föreskrifter och allmänna råd omundanröjande av enkelt avhjälpta hinder till och I lokaler dit allmänheten har tillträde och på allmänna platser.* BFS 2003:19 – HIN 1. Karlskrona: Boverket.

_____. Swedish Board of Housing, Building and Planning (Boverket) (2004). Accessibility and usability in public spaces.[84] *Boverkets föreskrifter och allmänna råd om tillgänglighet och användbarhet för personer med nedsatt rörelse – eller*

[81] The Singapore *Code on Barrier-free Accessibility in Buildings* (2007) is available at http://www.bca.gov.sg/BarrierFree/others/AccessibilityCode2007.pdf.
[82] Available at http://www.boverket.se/Om-Boverket/Webbokhandel/Publikationer/2008/Building-Regulations-BBR/ .
[83] Available at http://www.boverket.se/Om-Boverket/Webbokhandel/Publikationer/2008/Code-of-statues/.
[84] Available at http://www.boverket.se/Om-Boverket/Webbokhandel/Publikationer/2009/Accessibility-and-usability-in-public-spaces/.

orienteringsförmåga på allmänna platser och inom områden för andra anläggningar än byggnader. BFS 2004:15 ALM 1. Karlskrona: Boverket.

United States. Access Board (2004). Americans with Disabilities Act, and Architectural Barriers Act Accessibility Guidelines. Washington, D.C.: U.S. Architectural and Transportation Barriers Compliance Board.[85]

Uruguay. Instituto Uruguayo de Normas Técnicas, Comité Especializado de Normalización, sobre Accesibilidad al Medio Físico (2004). GUIA UNIT 200: 2004 Accesibilidad de las personas al entorno edificado – Niveles de accesibilidad recomendados. Montevideo.

Since building codes provide statutory minimum technical specifications for built environments, the study reviewed codes and standards with reference to 31 accessible building design elements:

- Anthropometrics: concern the range of "building blocks" of specific dimensions detailed for people with various mobility devices and end-user needs;
- Access routes: include accessibility in pedestrian areas through a facility, in areas serving the public and in work areas;
- Auditorium, arena and assembly areas: provide accessible seating and viewing areas, assistive listening devices, and ease of access to stage;
- Bathtubs: provide space for safe access, non-slip flooring, grab bars, allowable, safe water temperatures and accessible faucets;
- Benches and picnic areas: placement and provision of accessible street furniture;
- Cafeterias and restaurants: provide maneuvering space, accessible tables, serving counters as well as vending machines, and payment stations;
- Communications: provide assistive listening systems, particularly when audio services are integral to use of a space or facility;
- Computer rooms: ease of access to and within computer operations for all users;
- Curb ramps, crossings and islands: must be stable, firm and slip resistant, provide a level transition area to adjacent areas, be of minimum width for users of mobility aids and of minimum running slope for ease of use;
- Detectable indicators: provide accessible hazard and direction indicators for all users;
- Doors and thresholds: main entrances must be accessible and provide users of mobility aides minimum width, accessible exterior and interior thresholds and maneuvering space;
- Drinking fountains: location and placement ensure ease of access, height of water spout and ease of use of controls for a wide-range of users;
- Elevators: door width and interior space appropriate for wheelchair users and personal assistant as appropriate, placement and accessibility of controls;
- Entrances: provide navigation aids for persons with visual impairments or those with cognitive limitations;
- Fire safety: provide fire procedures in alternative formats for building occupants with disabilities or who require additional assistance;
- Handrails: specification of placement and size to ensure ease of use;

[85] The "ADA Standards Homepage includes link to the both ADA and ABA *Guidelines*, available at http://www.access-board.gov/ada/.

- Kitchens: provide appropriate maneuvering space, placement and location of counters and related kitchen facilities;
- Libraries: provide ease of access and appropriate maneuvering space, availability of information in alternative formats;
- Lodging and transient accommodations, including hostels, university residences, and all types of short-term accommodations: provide accessible doors, windows and storage spaces in rooms, and warning devices in alternative formats;
- Meeting, board and training rooms: provide access aisles and accessible seating appropriate for users of mobility aides, illumination levels are appropriate for all users, and information resources in alternative formats;
- Parking: designation, placement and provision of accessible parking;
- Passenger drop off and pickup areas: designation, placement and size of accessible passenger zones for all transportation services (public and private);
- Ramps: specification of minimum slope, landing, and designation of entrance / exit;
- Security access systems: placement on accessible routes, and location and controls present no barriers to persons with disability;
- Showers: provide ease of access, adequate space for maneuvering, non-slip surfaces, proper illumination, accessible controls and good drainage;
- Signage: specification of design, placement and location of accessible signage, including tactile information resources;
- Stairs: specification of riser height, width, and vertical headroom, provision of warning indicators in alternative formats, and location by windows and doors;
- Telephones: availability of accessible public telephones for users of wheelchairs and for those who are deaf or hard of hearing;
- Washrooms: provide ease of access and signage in alternative formats; specification of accessible washroom facilities, such as toilets, urinals and basins;
- Individual accessible washrooms: specifications for facilities that can be used by women and men alike with personal assistant as appropriate;
- Workstations and computer operations rooms: specifications for ease of access and maneuvering space, provision of information resources in alternative formats.

A review of the tables that present the standards and codes with reference to the 31 accessible building design elements reveals a number of empty cells. This indicates that no standard is available in the code under review for the particular design element - although it may be addressed in a code revision. There also is observed variation in technical specifications among codes, which reflects different ways in which jurisdictions specify accessibility provisions in response to local conditions, regulatory experience and end-user preferences. Variation in coverage and in level of technical specification in building codes and accessibility standards would suggest: (1) not all accessibility standards may be applicable to all development settings, which strengths the case for specifying performance requirements rather than technical minimums for environmental accessibility; (2) accessibility norms and standards are always under development; or (3) authorities may be employing a "best possible solution"[86] approach to promoting accessibility in built environments in the light of available technical and financial resources, personnel and institutional capacities and end-user interests, needs and capacities.

[86] See the discussion in Michael Treacy and Fred Wiersema, *The discipline of market leaders*. (Reading, Massachusetts: Addison-Wesley, 1997).

C. International standards related to accessibility in built environments, transportation systems and public facilities

1. Role of non-binding instruments: Standard Rules on Equalization of Opportunities for Persons with Disabilities

The non-binding United Nations Standard Rules not only stimulated a number of bottom-up initiatives in environmental accessibility but influenced decisions by governing bodies of international organizations on accessible air travel and accessible work environments.

(a) **International Civil Aviation Organization**: Chapters 1 and 8 of *Annex 9 - Facilitation to the Convention on International Civil Aviation; access to air services and airport facilities by elderly and disabled persons.*[87]

Pursuant to direction from the ICAO Assembly, the Tenth Session of the Facilitation Division (FAL/10 - 1997) introduced Standards and Recommended Practices (SARPs) in Annex 9 on access to air services and airport facilities by the elderly and persons with disabilities:

> Chapter 1 of Annex 9 defines "Person with disabilities" as "Any person whose mobility is reduced due to a physical incapacity (sensory or locomotor), an intellectual deficiency, age, illness or any other cause of disability when using transport and whose situation needs special attention and the adaptation to the person's needs of the services made available to all passengers."
>
> Chapter 8 of Annex 9 contains two Standards and fifteen Recommended Practices that address accessibility to all elements of the air transport chain by persons with disabilities.
>
> The Standards require that airport facilities and services are adapted to the needs of persons with disabilities, and that persons with disabilities have adequate access to air services:
>
> **Standard 8.27**. Contracting States shall take the necessary steps to ensure that airport facilities and services are adapted to the needs of persons with disabilities.
>
> **Standard 8.34**. Contracting States shall take the necessary steps to ensure that persons with disabilities have adequate access to air services.
>
> ICAO also prepared guidance material, ICAO Circular 274 - *Access to Air Transport by Persons with Disabilities* (Montreal, 1999), that elaborate on Annex 9 Standards and Recommended Practices concerning persons with disabilities to assist the civil aviation community in the day-to-day application of these SARPs.[88]

[87] Available at http://legacy.icao.int/icao/en/atb/sgm/disabilities.htm.

[88] "Response by International Civil Aviation Organization," Ad Hoc Committee on a Comprehensive and Integral International Convention on Protection and Promotion of the Rights and Dignity of Persons with Disabilities, fourth session (New York, 23 August - 3 September 2004) available at http://www.un.org/esa/socdev/enable/rights/uncontrib-icao.htm#Response.

The Eleventh Session of the Facilitation Division (FAL/11 - 2002) built upon the work of FAL/10 by introducing new SARPs to reflect additional concepts, which include:

(a) opportunity for wheelchair users to use their own wheelchairs to move to and from the aircraft;
(b) establishment and coordination of training programmes for personnel handling elderly and disabled persons;
(c) uniformity of criteria for accessibility of air transport by persons with reduced mobility;
(d) accessibility of all the elements of the chain of a journey by a person with reduced mobility;
(e) practices relating to special equipment in aircraft, allocation of seats, type of lighting in aircraft, the use of wheelchairs on board;
(f) the introduction of special provisions relating to evacuation procedures;
(g) accommodation of service animals in aircraft cabins; and
(h) need for a strategy to harmonize air transportation regulations and [Annex 9] Recommended Practices" encouraging the treatment of persons with disabilities with dignity and consideration.

(b) **International Labour Organization**: *Managing disability in the workplace; ILO code of practice*[89]

ILO drafted the code as a guide for employers in managing disability-related issues in the workplace. The code is based upon principles of international instruments concerning persons with disabilities and ILO conventions and recommendations on promoting safe, secure and healthy employment of persons with disabilities. The code is not legally binding, nor is it intended to supersede or replace national legislation. The code is to be consulted in the context of national conditions and applied in accordance with national laws and practice. The code was finalized and adopted at the tripartite meeting of experts in Geneva, 3-12 October 2001, convened at the decision of the ILO Governing Body, taken at its 277th Session (March 2000).

2. Convention on the Rights of Persons with Disabilities and global accessibility benchmarks and functional requirements

The growing number of ratifications of and accessions to the Convention on the Rights of Persons with Disabilities has contributed to discussions on global benchmarks on functional accessibility requirements and technical standards for accessibility in the built environment and transportation systems - public and private - to assist State parties, particularly those which have not yet enacted accessibility provisions in national building codes and standards.

Participants of the 2010 United Nations expert group meeting identified several basic considerations in such a task and discussed standards work underway by the European Committee on Standardization (CEN) and by the International Organization for Standardization (ISO).

[89] ILO: Geneva, 2002, available at http://www.ilo.org/skills/pubs/WCMS_103324/lang--en/index.htm. See also ILO (2010). *Disability in the Workplace: company practices.* (Working paper no. 3). (Geneva: ILO).

Participants noted that any set of global performance requirements and technical standards on accessibility should produce results for persons with disabilities and non-disabled persons alike. Universal Design principles and concepts are important considerations in this regard. An expert presented a "four-step model" on applying Universal Design concepts in planning and developing accessible environments for all:

1. **Adopt and decide**: have we decided on principles on what to do, and for whom?
2. **Co-ordinate:** are we coordinating effectively internally and between organisations and authorities?
3. **Implement:** are [appropriate] resources being allocated and decisions being carried out in practice?
4. **Evaluate:** do we evaluate results and make corrections if necessary?[90]

The experts noted the model focussed less on definition of a particular set of accessibility standards than on results and outcomes of provision of accessibility with reasonable accommodation. He added that experience suggests "life cycle" approaches to accessible design are essential in achieving effective and sustainable environmental accessibility for all:

- While governments may formulate "excellent" accessibility requirements in terms of legislation and technical standards, resource allocations may not be sufficient for the tasks of promoting awareness, implementation, monitoring and quality assessment of results achieved, and conducting, post-occupancy studies among end users. Environmental accessibility thus may obtain mixed success, impact and sustainability.
- Governments that decide to adopt "average" standards but employ appropriately supported and well-coordinated implementation and systematic follow-up often attain better and more sustainable environmental accessibility for all.

3. Selected regional and global standards on accessible built environments

Developing a set of global accessibility benchmarks, functional requirements and technical standards will involve reviews of current best practices and practical experiences in promoting environmental accessibility as a global public good. Two experiences are presented: European Union experience in elaborating European-wide standards on accessible built environments, which covers more than ten years, and the International Organization for Standardization experience in drafting guidance on accessible buildings and spaces.

(a) European Committee for Standardization; Technical Committee (CEN/BT): "Accessibility in built environment" (joint report CEN/BT/WG 207)[91]

The principle theme of CEN/BT/WG 207 is accessibility in the built environment is an essential and fundamental right for all. Accessible environments enable and empower all members of society to participate on the basis of equality in social life and development, and

[90] Soren Ginnerup (2010). "Background note on … accessibility;" paper contributed to *United Nations Expert Meeting on Accessibility* (World Bank, Washington DC, 28-30 June). Available at http://www.un.org/disabilities/default.asp?id=1537.

[91] Available at ftp://ftp.cen.eu/cen/Sectors/Accessibility/Draft_Joint_Report_2011-08-03_version_PC.pdf.

in civil and political affairs. The report draws on the "Design for All" concept[92] and its focus on preventing - or minimizing - obstacles or barriers to participation by all.

The report notes that while the benefits of environmental accessibility are well known, there are examples in current built environments where buildings and spaces – public and private - do not provide appropriate levels of accessibility. It addresses the question through review and analysis of national accessibility regulations and standards of European Union member countries and internationally[93] and examines how their presence and enforcement assist or hinder provision of accessibility in built environments. The review found that a substantial body of regulations, standards and guidance are available – as at November 2010 - to guide design and provision of accessible built environments. Some gaps and weaknesses in national documents concerning functional accessibility requirements, which were either not specified or incompletely developed, and technical specifications of building types and elements, which mainly involved users with certain impairments, such as mental health, learning disability, cognitive abilities, and allergies. Conformity assessment of accessibility standards varied among European Union member countries. Building inspection activities (BIA) are in place in all EU member countries, although $_{BIA}$ inspection coverage differs from country to country. To address identified issues the report recommends introduction of common European Union-level approaches to definition of functional requirements, minimum technical standards and conformity assessment (in public procurements), and improved training of environmental design professionals.

The joint report, "Accessibility in the built environment," provides important lessons on the role of policy and legislation, institutional arrangements and systematic consultations in developing performance requirements and technical standards on environmental accessibility.

(i) Policy and legislative background to the CEN/BT/WG 207 joint report

CEN/TB/WG 207 joint report is based on the European Union legal framework on accessibility in the built environment, which dates from 1999. Article 13[94] of the *Treaty of Amsterdam amending the Treaty of the European Union, the Treaties establishing the European Communities and certain related acts* provides a legal base to take action to combat discrimination, inter alia, based on disability. In November 1999 the European Commission adopted a series of measures to combat discrimination, based on Article 13 of the Amsterdam Treaty, which included the Council Directive on Equal treatment in

[92] The Design for All Foundation < http://www.designforall.org/> states that "'Design for All' is the intervention in environments, products and services with the aim that … everyone can participate in …society on an equal basis." Application of "Design for All" is based on two principles: (1) make the use of products and services easier for everyone, and (2) ensure … the needs, wishes and expectations of users are taken into consideration in the design and evaluation processes of products or services. Design for All concepts and practices are central to the activities of EIDD (European Institute for Design and Disability) - Design for All Europe network, a federation of 33 Member Organizations in 23 European countries established in 1993, at Dublin, Republic of Ireland, with the aim of using design to achieve inclusion of persons with disabilities in society in European countries and to enhance their quality of life. EIDD – Design for All Europe notes that "Design for All is design for human diversity, social inclusion and equality. … [that] aims to enable all people to have equal opportunities to participate in every aspect of society. To achieve this, the built environment, everyday objects, services, culture and information … must be accessible, convenient for everyone in society to use and responsive to evolving human diversity." Available at http://www.designforalleurope.org/Home/.

[93] CEN/TB/WG 207, op. cit., Bibliography, pp 122-169.

[94] The *Treaty of Amsterdam* was signed on 2 October 1997 and entered into force on 1 May 1999; available at http://europa.eu/legislation_summaries/institutional_affairs/treaties/amsterdam_treaty/a10000_en.htm.

employment and education (2000/78/EC). [95] Council Directive 2000/78/EC includes provisions on non-discrimination on grounds of disability (article 2), on reasonable accommodation to enable a person with a disability to have access to, participate in, or advance in employment, or undergo training (article 5), and on positive action related to measures to create or maintain provisions or facilities to safeguard or promote integration persons with disability into working environments (article 7).[96]

(ii) Institutional arrangements for developing accessibility standards

European Commission Directive 98/34/EC identifies the European Committee for Standardization (CEN) as the European organization responsible for planning, drafting and adopting European Standards in all areas of economic activity, except electrotechnology (CENELEC) and telecommunication (ETSI). The 32 National Members of CEN develop jointly voluntary European Standards (ENs), which have a unique status since they also are national standards in each of its 32 Member countries.

In September 1999, the European Commission issued mandate M/283 to European standardization organizations to prepare a guidance document for standards developers on safety and usability of products by people with special needs (older persons and persons with disabilities), including accessibility in the built environment. This was issued as CEN/CENELEC Guide 6: *Guidelines for standards developers to address the needs of older persons and persons with disabilities* (Edition 1, January 2002).[97]

Guide 6 had three aims: (1) to inform, increase understanding and raise awareness about how human abilities - sensory, physical, cognitive and allergy - impact on usability of products, services and environments; (2) to outline the relationship between requirements in standards and accessibility and usability of products and services, and (3) to raise awareness about benefits of adopting accessible design principles in terms of wider markets.

Guide 6 outlines al framework and a process that standards developers may use to address the needs of older persons and persons with disabilities in the standards development process, when drafting new standards and revising existing standards. Seven tables present "factors to consider" to assist standards developers identify factors that can affect the use of a product, service or environment and consider their significance for persons with different abilities:

1) Factors to consider in standards clauses on information, based on ISO/IEC Guide 37:1995;
2) Factors to consider in standards clauses on packaging (opening, usage, disposal);
3) Factors to consider in standards clauses on materials;
4) Factors to consider in standards clauses on installation;
5) Factors to consider in standards clauses on user interfaces;
6) Factors to consider in standards clauses on maintenance, storage and disposal;

[95] Directive 2000/78/EC entered into force on 27 November 2000; available at http://europa.eu/legislation_summaries/employment_and_social_policy/employment_rights_and_work_organisation/c10823_en.htm.
[96] Available at http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32000L0078:EN:HTML.
[97] European Committee for Standardization (CEN) and European Committee for Electrotechnical Standardization (CENELEC). Edition 1, (Brussels, 2002), available at ftp://ftp.cen.eu/boss/reference_documents/guides/cen_clc/cen_clc_6.pdf .

7) Factors to consider in standards clauses relating to the built environment (buildings).

Guide 6 presents each "factor to consider," with reference to suggested standards clauses, discusses the human abilities - sensory, physical and cognitive – covered in terms of causes and consequences of impairment, and includes a section on allergies, since they can impose limitations on an individual's activities or can be potentially life-threatening.

(iii) Observance of European Year of People with Disabilities (2003) and environmental accessibility

Observance of the "European Year of People with Disabilities" in 2003 included adoption of a policy commitment on accessibility in the built environment, which noted that accessible environments are a key to a society based on equal rights and provide all citizens with autonomy and means to pursue an active social and economic life.

Within the framework of the Year, the European Commission (EC) established an Expert group to review accessibility legislation among European Union member States and to submit proposals to improve accessibility in the built environment. Their report[98] noted:

> "Accessibility means firstly that **everybody should have equal access to the built environment**, i.e.:
>
> "- The **buildings**. They can be *public*, either run by the public service … or run by a business (shops, restaurants, offices etc). They may be *private* dwellings. Special attention should be paid to *historical buildings*, where experience shows that they too can be made accessible without compromising their architectural or historic integrity. Accessibility requirements change in relation to the nature and use of the buildings – which themselves may change faster than before, with housing transformed into office space, for instance-, with public authorities being given a special responsibility to demonstrate "good practices". These requirements will also differ in relation to new or proposed buildings and existing buildings, which are dealt with in most legislation through renovation or adaptation works.
>
> **"- What is around and between buildings**: the streets, roads, pavement, footways, the signage, the open spaces and recreational areas…. Accessibility for all means ... these areas are safe, convenient and enjoyable for everybody. Transport facilities belong to the built environment …. Accessible means of transport are an essential prerequisite for accessibility to the built environment.
>
> "- The "**virtual environment**". In our knowledge-based societies, the built environment increasingly includes electronic devices and equipment such as access pads, environmental controllers, automated vending machines, alarms etc. Information and communication technologies are a key element of accessibility to the built environment, and they should contribute to lifting barriers that exist for people with disabilities and be manageable by people with

[98] European Commission Expert Group on Accessibility (2003). *2010: A Europe Accessible for All.* Brussels: European Commission for Employment and Social Affairs, available at http://www.ozida.gov.tr/raporlar/uluslararasi/ab/ABdokumanlar/europaaccessibleforall.pdf.

sensory and mental disabilities as well. With the fast diffusion of these technologies, more and more "smart constructions" will be built.

...

"*Accessibility" means providing buildings and places which are designed and managed to be safe, healthy, convenient and enjoyable to use by all members of society. It implies that buildings should be accessible, that they should be really "usable" from ground floor to the top, and that adequate means of autonomous exit should be provided.*"[99]

(iv) *Guide 6* follow up

As follow up to recommendations of the 2003 Expert group, the European Committee for Standardization (CEN) sent in 2006 a questionnaire on *Guide 6* usage and found that only 3 out of 275 CEN committees had used *Guide 6*.

The Dutch standards organization (NEN) and Standards Norge undertook, in 2007 and 2008, further studies on *Guide 6* usage and found that the (then) Construction Products Directives of the European Union – since replaced by EU Construction Product Regulation (305/2011/EC-CPR) - contained no legal obligation for accessibility in the built environment.

Another reason for limited implementation of *Guide 6* identified was limited knowledge of accessibility issues and requirements among standards developers. If they were not accessibility experts or had knowledge of disability, developers often encountered problems using functional accessibility requirements presented in *Guide 6* on features of products, services and environments to assist usage by older persons and persons with disabilities.

In response to these findings, the European Commission issued, in December 2007, mandate M/420 to CEN, CENELEC and ETSI which had two objectives:

(1) facilitate public procurement of accessible built environments, following the "Design for All" principles, by developing a set of standards and technical specifications that contain: (a) a set of functional European accessibility requirements of the built environment, and (b) a range of minimum technical data to comply with those functional requirements; and

(2) provide a mechanism through which public procurers have access to an online toolkit to enables them to use the harmonized requirements in procurement processes.

(v) CEN/TB/WG 207: Accessibility in the built environment (Phase I); overview

EC mandate M/420 implies that a distinction is to be made between design of buildings, including access to and from a building (or accessible infrastructure), and accessibility of floors and rooms inside a building, open venues, civil engineering work and construction products. Work related to EC mandate M/420 would be implemented in two phases: (1) an inventory and feasibility of European and international accessibility standards in the built environment and (2) standardization activities. Joint report CEN/TB/WG 207 covers Phase I.

Preparation of the report involved collecting and inventorying accessibility standards from European Union (EU) member countries, three European Free-Trade Area (EFTA) countries

[99] Ibid. pp. 5-6; bold and italic texts are retained from source document.

(Liechtenstein, Norway, Switzerland), and six other international experiences (USA, Australia, Canada, New Zealand, Singapore, South Africa and United States). The International Organization for Standardization Final draft of international standard (ISO/FDIS) 21542, *Building Construction – Accessibility and usability of the built environment* was used to benchmark country experiences. Data were summarized in common spreadsheets of 23 countries: 17 EU countries (Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Luxembourg, Netherlands, Portugal, Romania, Spain, Sweden and United Kingdom); two EFTA countries (Norway and Switzerland); and four international experiences (Australia, Canada, Singapore and United States).

Building elements were examined with reference to four main areas: (1) external environments and approaches to buildings, (2) internal environments, (3) transport facilities, and (4) specific building uses, including open spaces and public accommodations.

The report considered the following set of human abilities and consequences of impairments in its analysis of coverage as well as gaps in accessibility legislation, standards and guidance for design and planning of the built environment, for construction products and for services:

- People using a wheelchair or other mobility aid,
- People with walking difficulties,
- People with vision impairments or who are blind,
- People with hearing impairments or who are deaf,
- People with reduced manual dexterity, arm function or strength,
- People with diversities in age and stature,
- People with intellectual, cognitive or mental impairments,
- People with allergies, and
- People with diversities in age and stature.[100]

The analysis of functional requirements in accessibility in national legislation and standards examined ways in which they address challenges and opportunities that end users with different abilities and bodily structures experience in any environment. The report presents three general parameters for defining functional requirements for accessibility: (1) equitable access and use of the built environment by all persons, (2) health, and safety in use of buildings, environments, equipment, and (3) comfort in the built environment.

The review of select accessibility standards and conformity assessment schemes found:

1) **Coverage**: a substantial amount of regulation, standards and technical guidance currently is available to assist in design and delivery of accessible built environments both among EU member countries and internationally. Gaps exist, but the review found few accessibility requirements and building elements that are not appropriately covered by a regulation, standard or guidance.
2) **Gaps**: the review identified three basic types of gaps: (a) a functional requirement for accessibility is missing – or partially covered - from a guidance document or requirements statement; (b) no technical specification for a built environment element or building type is available, or the specification is incomplete or not well developed;

[100] The category "Diversities in age and stature" includes older persons and children as well as people who are very short, tall or obese. Needs of older persons are considered in other user need categories to reflect the range of impairments they may acquire, such as changes in motor, sensory and cognitive functions.

and (c) general principles are presented without clear and firm guidance. Gaps identified cover a wide range of end users, which include (a) people with certain impairments, such as mental health, learning disabilities, cognitive abilities, and allergies; (b) use of built environments by children and older persons; and (c) accessibility requirements that focus on buildings but provide limited guidance on accessibility in outdoor built environments, which can affect equality of use particularly as this involves age, gender, religion, ethnicity and social grouping.

3) **Compliance**: regulatory compliance, monitoring and enforcement of standards vary among EU member countries, which may be due to different legislative practices policies and compliance procedures adopted by respective countries. It may also reflect different views and expectations of the role that regulations and standards play in design, planning and construction processes of individual EU member countries.
4) **Conformity assessment**: frameworks for conformity assessment in EU member countries were considered weak by the review, with poor consideration accorded to accessibility matters. The review did not study specific cases of public tendering and conformity assessment but was of the view that data available suggest systems of enforcing legislation, regulation and guidance could be improved in many EU countries to improve building control practices. It observes that introducing more regulations, mandates or directives or providing additional guidance documents without addressing inadequate and ineffective conformity assessment and enforcement processes currently in place is unlikely to improve the current situation. Special note is made of the contribution of incentives and public recognition in promoting accessibility in built environments.
5) **Skill development and expertise**: relevant experience, technical qualifications and professional expertise in accessibility and accreditation of those responsible for ensuring compliance or conformity with accessibility regulations and standards varies among EU member countries. The review of available data suggest that in most cases training and levels of experience in accessibility issues is inadequate and contributes to the observed lack of accessibility in finished projects.
6) **Instances of good practice are available**: the review found many instances of current good practice concerning laws, standards and guidance on various aspects of accessibility in many countries – European and internationally, which reflect respective practices and priorities for accessible built environments. The study notes EU public procurement can better promote development of accessible built environments based on common approaches, which draw upon examples of current good practice, in terms of a common set of references, procedures and tools to which countries could refer and use for guidance.

To address identified weaknesses in accessibility legislation, guidance and conformity systems in Europe, the report recommends introduction of a common, European Union-level approach to requirements specification, accessibility standards and conformity assessment, which would involve: (1) preparation and adoption of an EU technical reference document (EN standard) for basic functional requirements for accessibility of the built environment; (2) preparation and adoption of an EU technical reference document (EN standard) of minimum technical specifications, related to the functional requirements; and (3) preparation and adoption of an EU "model" for tendering and conformity assessment to address accessibility throughout public procurement processes. Noting many instances of good practice, the report further recommends that EU-wide basic requirements and specifications documents be developed in the light of existing guidance world-wide and relevant European Union legislation and procedures be considered in the enforcement of common requirements

throughout EU member countries in public procurements and within the framework of EU Construction Product Regulation.[101]

The report suggests that implementation of common approaches include development of "tool kits" and "model" procedures to assist those responsible for public procurement identify legal requirements for equality and inclusion and how these should be addressed in promoting development of accessible, inclusive built environments. Guidance on effective and efficient measures to deal with non-compliance is required as well.

The joint report notes the proposed set of common EU-level documents and conformity assessment procedures is not expected to replace existing systems of legislation, guidance and control in the EU member countries but serve as minimum requirements and specifications. EU and national lawmakers would need to decide whether the proposed set of common accessibility documents should be enforced by EU legislation, possibly with respect to European Community-funded projects, as a requirement in cases where funding is provided for built environment design and construction works.

To address skill development and accreditation concerns the joint report recommends consideration be given to (1) development and introduction of an EU- wide scheme for accreditation in environmental accessibility and (2) improved training of environmental design and related professions concerned with accessible built environments.

(vi) European Disability Strategy 2010-2020 and environmental accessibility

On 15 November 2010 the European Commission adopted the European Disability Strategy 2010-2020 with aim of breaking down barriers that prevent persons with disabilities from participating in society on an equal basis.[102] The Strategy states that disability is regarded as an issue of rights rather than one of discretion and outlines how EU and national governments can empower people with disabilities so they can fully enjoy their rights.

Improving accessibility to goods and services, health care, employment and education is a specific measure in the Strategy. Proposed actions include use of standardization, public procurement, or grant aid and assistance rules to make goods and services accessible to people with disabilities and foster an EU market for assistive devices in line with the proposed "European accessibility act."[103]

(b) ISO 21542:2011: "Construction Industry - Accessibility and usability of the built environment"[104]

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[101] European Commission "Construction Products Regulation" aims to ensure reliable information on construction products in relation to their performance by providing a "common technical language," which offer uniform assessment methods of performance of construction product, available at http://ec.europa.eu/enterprise/sectors/construction/legislation/index_en.htm.

[102] Available at http://ec.europa.eu/social/main.jsp?langId=en&catId=89&newsId=933&furtherNews=yes ; document COM (2010) 636 final available at http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:0636:FIN:EN:PDF.

[103] Indicative roadmap available at http://ec.europa.eu/governance/impact/planned_ia/docs/2012_just_025_european_accessibiliy_act_en.pdf.

[104] International Organization for Standardization (ISO), Geneva, available at http://www.iso.org/iso/iso_catalogue/catalogue_ics/catalogue_detail_ics.htm?csnumber=50498; ISO Final Draft International Standard ISO/FDIS) 21542 available at : http://www.sustainable-design.ie/arch/ISO-FDIS-21542_Accessibility-for-All_September-2011.pdf.

Document ISO 21542: 2011 is the product of international collaboration spanning several years. Its aim is to present a broad statement on good practice in providing sustainable built environments that are accessible, and how that can be achieved. It was prepared by Technical Committee ISO/TC 59, *Buildings and civil engineering works*, Subcommittee SC 16, *Accessibility and usability of the built environment*. Consensus on its draft set of minimum accessibility standards led to publication as an International Standard on 12 December 2011.

ISO notes the purpose and principles of 21542:2011 respond to the Preamble (paragraph (g)) and Articles 9, 10 and 11 of the *Convention on the Rights of Persons with Disabilities*.

(j) Scope of ISO 21542:2011

Intended audiences for ISO 21542:2011 include building users, architects, designers, engineers, builders, building owners and managers, manufacturers, policy makers and legislators. The document presents requirements and recommendations for elements of construction, assemblies, components and fittings that comprise the built environment with the aim of promoting sustainable built environments that are accessible. Requirements and recommendations pertain to construction aspects of access to buildings, to circulation within buildings, to entry and egress from buildings under normal conditions and evacuation in emergency situations, and to specific building uses.

The document discusses features in external environment that affect access to a building or group of buildings from the edge of a site boundary or between groups of buildings in a common site. It does not deal with elements of the external environment, such as public open spaces, whose function is self-contained and unrelated to use of a specific building. Nor does it deal with single family dwellings other than those with circulation spaces and fittings common to two or more dwellings.

The International Standard applies to new and existing built environments, noting that most buildings are subject to refurbishment, upgrade or change of use at some stage of the life cycle. However, guidance specifically directed to existing buildings is somewhat limited.

The document includes an information annex on management and maintenance of the built environment to ensure accessibility and usability on an ongoing basis.

(ii) Purpose

ISO 21542: 2011 defines how sustainable built environments should be designed, constructed and managed to enable people to approach, enter, use, egress from and evacuate a building independently in an equitable and dignified manner. Guidance aims to meet the needs of a majority of people and not any particular group, and is based on minimum standards that are generally accepted to accommodate diversities of age and of human condition. It notes that some countries have achieved a higher levels of technical specification on provision of accessible environments due to a long history in developing accessibility standards and regulations. Requirements and recommendations presented are not intended to replace more detailed or demanding requirements in national standards or national regulations.

(i) Design considerations: focus on human abilities

The document notes that diversity of human abilities is normal, and requirements presented respond to the principal human abilities to be considered when designing, constructing and managing sustainable built environments that are accessible. An information annex lists principal human faculties to consider when designing, constructing and managing built environments that are accessible. The annex has a specific section on design considerations to allow built environments to accommodate: (a) different levels of physical, sensory and mental ability, and (b) needs of the developing child, older persons and diversity in stature.[105] The International Standard is expected to benefit to all people, including:

- people with hearing impairments,
- people with vision impairments,
- people with mobility impairments,
- people with cognitive impairments,
- people with non-evident impairments, such as strength, stamina, dexterity and allergy, and
- people with diversities in age and stature (including frail persons).

(ii) Accessibility considerations in built environments

Accessibility considerations include:

- pedestrian access into site,
- designated cycle and motor vehicle parking near main entrance(s),
- accessible path to entrance(s),
- appropriate external lighting,
- accessible external furniture, such as seating, bins, and similar street furnishings,
- accessible information resources and services at entrance(s) to the site,
- appropriate drop-off point near main entrance(s),
- reduced travelling distances to accessible building elements,
- level entrances and exits,
- simple, clear and logical layouts,
- unobstructed level circulation to and within a building or facility,
- easy access to information desks, lifts and toilet compartments for people with disabilities,
- intuitive, obvious and accessible fire and emergency evacuation routes,
- spacious lifts for people using mobility aids and personal assistants,
- stairways that are safe and easy to use individually and that facilitate safe assisted evacuation or rescue in emergencies,
- slip-resistant walking surfaces,
- wide door openings and ease of door operation with sufficient space around doors to make it possible to open and close them when seated in a wheelchair,
- adequate maneuvering space,
- adequate height, location and easy operation of controls and switches, particularly for users of wheelchairs and similar mobility aids,

[105] Annex B, "Human abilities and associated design considerations" of the ISO 21542:2011 notes that wide diversity in stature in the population – height and girth in particular – has resulted in a demand for more rationalization, internationally, in the use of anthropometrics and ergonomics – as well as their increased influence - in the design of built environments.

- good lighting,
- good visual contrast of walls, floors, doors and signage,
- good signage,
- important building orientation, usage and emergency information communicated via two senses or more, such as tactile, audible and visual,
- good acoustics,
- hearing enhancement systems, and
- management and maintenance of accessible and usable built environments on an ongoing basis.

(iii) Topical coverage of accessible building elements and buildings

ISO 21542:2011 presents requirements and recommendations on provision of accessible designs related to (a) access to buildings, and their egress and evacuation, (b) circulation within buildings, (c) traffic, and transportation facilities, and (d) specific building uses. Topics considered under these four aspects of built environments are summarized below.

1. **External environment**:

- Approaches and access routes,
- Car parking and van parking
- Gradients and ramps
- Signage
- Paths to building
- Way finding, guided path(s), other physical support of information,
- Steps, stairs and landings,
- Handrails,
- Obstacles on a path,
- Street furniture, seating and rest areas,
- Facilities for service animals, including guide dogs

2. Internal environment

- Entrances, and final fire (and emergency) exits,
- Horizontal circulation, including maneuvering space requirements and circulation space for wheelchair users,
- Vertical circulation, including ramps in buildings,
- Lobbies, reception areas, information counters, services desks, and ticket offices,
- Cloakrooms
- Seating in waiting areas, at desks and kiosks
- Lighting, both external lighting and natural and artificial interior lighting,
- Switches, outlets and controls
- Signage and way finding, both external and internal,
- Floor and wall surfaces,
- Internal doors, including ease of use factors and accommodation of mobility aid users,
- Windows, including window hardware
- Stairs,
- Handrails,
- Passenger lifts (elevators),
- Vertical and inclined lifting platforms,

- Escalators, moving walks,
- Sanitary facilities for ambulant people with disabilities (toilets/showers/changing),
- Sanitary facilities for wheelchair users (toilets/showers/changing),
- Sanitary facilities for other users, such as children, older persons, people with diverse stature (enlarged facilities/special fittings and signage/emergency warning system),
- Glazing, manifestations and markings,

3. **Traffic facilities**

- Car and van parking,
- Parking facilities and control,
- Public transportation

4. **Specific building uses**:

- Auditoriums, concert halls, museums, sports arenas and public stadiums,
- Conference facilities and meeting rooms,
- Restaurants, pubs and similar public accommodations,
- Accessible balconies, terraces and verandas in public accommodations,
- Accessible sanitary facilities in public accommodations,
- Accessible bedrooms in non-domestic buildings,
- Kitchens in non-domestic buildings,
- Storage facilities in non-domestic buildings,
- Acoustic environment in public accommodations,
- Floor and wall surfaces in public accommodations,
- Lighting in public accommodations,
- Fire and emergency warning systems in public accommodations,
- Equipment controls in public accommodations, location, ease of operability and usability, public telephones, drinking fountains, card access to automated kiosks, security access and related entry control devices,
- Furnishing and seating in public accommodations,
- Fire safety, protection and evacuation for all in public accommodations,
- Orientation and provision of information in public accommodations,
- Signage,
- Graphical symbols.

(iv) <u>ISO 21542:2011 in practice</u>

ISO 21542:2011 may be applied in accordance with relevant national regulations of ISO member national standard bodies that have adopted this International Standard and have stated in their National Foreword [to the International Standard] the terms under which it is to be applied. ISO notes it may be used by (a) national authorities to determine a specific programme of implementation, and (b) building owners to fulfill responsibilities according to anti-discrimination and equity legislation, or on a voluntary basis.

ISO notes that since most buildings are subject to refurbishment, upgrade or change of use at some stage during their life cycle, national regulators can require all or part of this International Standard to be applied. ISO adds it is also important to ensure that existing buildings of historical, architectural and cultural importance are accessible, although it may

be necessary for national authorities to allow some exceptions to the International Standard and recommend appropriate alternative accessibility measures.

The introduction to ISO 21542:2011 makes the case for accessible design, noting that if its requirements and recommendations are taken into account at an early stage of building design, costs of providing accessibility and usability measures are minimal and can raise the value of the property in terms of sustainability as well. Costs increase when alterations and refurbishment of existing buildings are required. ISO cites a study by the Swiss centre for construction adapted to needs of people with disabilities (*Centre suisse pour la construction adaptée aux handicapés*) that noted costs for provision for accessible buildings at the outset of design and construction, in Zurich, added about 1 per cent to construction costs; adaptation or refurbishment added about 3.5 per cent to these costs.[106]

D. Review of accessibility in the field of information and communication technologies

The pace of developments and expansion of information and communication technologies (ICTs), taking internet-based technologies as an example, in the late twentieth century resulted in considerable dialogue on the "central role" of ICTs in the "new economics" of development.[107] For instance, the "Ministerial Declaration" of the High-level segment of the year 2000 substantive session of the United Nations Economic and Social Council, considered the "role of information technology in the context of a knowledge-based global economy":

> "We recognize a wide consensus that information and communication technologies (ICT) are central to the creation of the emerging global knowledge-based economy and can play an important role in accelerating growth, in promoting sustainable development and eradicating poverty in developing countries as well as countries with economies in transition and in facilitating their effective integration into the global economy.
>
> . . .
>
> "The ICT revolution opens vast new opportunities for economic growth and social development but also poses challenges and risks. Along with important economic and social benefits, it can lead to further widening disparities between and within countries…. Unless access to and use of ICT is broadened, the majority of people particularly in the developing countries will not enjoy the benefits of the new knowledge-based economy."[108]

The Ministerial Declaration reflects the emerging "generative paradigm" of ICT and attaches priority to expanding global bandwidth to bring opportunities to un-served or under-served end users so they can partake in new, improved and expanded ways to exchange knowledge

[106] Centre suisse pour la construction adaptée aux handicaps, "La construction sans obstacle en chiffres," available at http://www.hindernisfrei-bauen.ch/kosten_f.php.

[107] See Pamela Samuelson and Hal R. Varian, "The 'new economy' and information technology policy," Paper prepared for "Economic Policy During the Clinton Administration," (John F. Kennedy School of Government, Harvard University, Cambridge, MA, 27-30 June 2001); publication version 18 July 2001 available at http://people.ischool.berkeley.edu/~hal/Papers/infopolicy.pdf.

[108] United Nations document E/2000/L.9, available at. http://www.un.org/en/ecosoc/docs/declarations/ministerial_declaration-2000.pdf .

and experiences, to engage in social, economic and cultural pursuits and to partake in civil and political affairs. However, the Declaration makes no mention of accessible ICT for all.

The Internet is providing new and innovative ways to participate in civil and political life. Initially this involved activities, whose development continues, related to e-government and delivery of a range of public services, information resources, processing tax and license payments, and registration for services and license renewals. A recent trend, associated with the expansion of social media[109] – such as Facebook <http://en-gb.Facebook.com/> with its reported 955 million monthly active users at the end of June 2012[110] - and micro-blogs – such as Twitter <https://twitter.com/> with 140 million active users as at March 2012[111] - is the rapid growth of online civil involvement in social, cultural and political affairs, as reflected in the promotion of initiatives, recruitment of volunteers and advocacy of issue-focused movements at community, national and higher levels.[112] Social media is provided by both proprietary, advertisement-supported services and the open-source community.

1. The Internet: a brief introduction

The Internet is a network of networks; a global, collaborative system of autonomous, interconnected computer networks that use the standard, open-source Internet Protocol Suite of Transmission Control Protocol (TCP) and Internet Protocol (IP) to support host-to-host communications:

> The Internet has no centralized governance in either technological implementation or policies for access and usage; each constituent network sets its own standards. Only the overreaching definitions of the two principal name spaces in the Internet, the Internet Protocol address space and the Domain Name System, are directed by a maintainer organization, the Internet Corporation for Assigned Names and Numbers (ICANN) [a non-profit corporation]. Technical underpinning and standardization of the core protocols (IPv4 and IPv6) is an activity of the Internet Engineering Task Force (IETF), a non-profit technical body.[113]

The World Wide Web is one of the services that run on the global Interne. It generally is defined as "a collection of text documents and other resources, linked by hyperlinks

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[109] A recent global study found that social networking is the most popular online activity worldwide accounting for nearly 1 in every 5 minutes spent online in October 2011, and reaches 82 per cent of the world's Internet population, representing 1.2 billion users around the globe; see comScore, *It's a social world: top 10 need-to-knows about social networking and where it's headed*. comScore White Paper (Reston, VA: ComScore, December 2011), press release available at http://blog.comscore.com/2012/01/its_a_social_world.html; report available at http://www.brandchannel.com/images/papers/534_comscore_wp_social_media_report_1212.pdf .

[110] Facebook reports that approximately 81per cent of its monthly active users are outside the United States and Canada and there were 552 million daily active users, on average, in June 2012; see Facebook Newsroom, "Key Facts," available at http://newsroom.fb.com/content/default.aspx?NewsAreaId=22.

[111] Official data on registered Twitter users is not available. User data cited is from Twitter blog, "Twitter turns six," (21 March 2012), available at http://blog.twitter.com/2012/03/twitter-turns-six.html.
Data compiled by comScore indicate that, as at October 2011, Twitter reached 1 in 10 worldwide Internet users – or some 220 million users; other micro-blogging platforms of note include Tumblr <https://www.tumblr.com/> , Sina Weibo <http://www.weibo.com/> and Tencent QQ <http://www.imqq.com/>; see comScore, *It's a social world*…, op. cit., p. 10.

[112] Neal Caren and Sarah Gaby, "Occupy Facebook," *Endeavors*. (University of North Carolina at Chapel Hill, Research, published online 24 February 2012), available at http://endeavors.unc.edu/occupy_Facebook.

[113] Available at http://en.wikipedia.org/wiki/Internet.

[hypertext transport protocol (HTTP)] and URLs [universal resource locators], and usually accessed by Web browsers from Web servers.[114]

The World Wide Web went operational on 6 August 1991, when the European Organization for Nuclear Research (CERN, Geneva, Switzerland) launched http://info.cern.ch as a public Web site to provide information on its networking project, on hypertext and on technical details of the World Wide Web. From that single Web site in August 1991, twenty-one years later – as at December 2011 – there were over 555 million registered Web sites worldwide[115] addressing a range of issues and providing numerous services. Not all Web-based resources are accessible, which is the subject of this review and its focus on practical and effective measure to promote Internet accessibility for all.

2. Technical guidance: Internet architecture, protocols and standards

Technical guidance of the Internet is comprehensive and involves technical bodies, non-profit organizations and professional societies, which deal with Internet architecture, technology, standards and protocol issues on a collaborative basis. These parties are summarized below.

1. Internet architecture and standards.

The Internet Society (ISOC) < http://www.internetsociety.org/>, a non-profit corporation, promotes open development of Internet standards, protocols, administration, and technical infrastructure through specialized technical units that operate under its auspices:

a. Internet Engineering Task Force (IETF) < http://www.ietf.org/>. The mission of IETF is to make "…the Internet work better by producing high quality, relevant technical documents that influence the way people design, use, and manage the Internet." IETF is not a formal organization but an open, international community of network designers, operators, vendors, and researchers concerned with the evolution of Internet architecture and its smooth operation, with a focus on engineering issues.[116] IETF standards development work is divided into eight areas, defined by the IESG [Internet Engineering Steering Group]: (1) Applications area (app), which focuses on three clusters of protocols: (a) protocols ubiquitous for some time, such as email, HTTP and FTP, (b) protocols used for Internet infrastructure, such as IDNA and EPP, and (c) protocols used as Internet "building blocks," such as LDAP, MIME types, URL schemes, URNs, OAuth, language tags; (2) General area (gen), which focuses on support, updates, and maintenance of IRTF standards development process; (3) Internet area (int), whose topical coverage includes IP layer (IPv4 and IPv6), implications of IPv4 address depletion, coexistence between IP versions, DNS, DHCP, host and router configuration, mobility, multihosting, identifier-locator separation, VPNs and pseudowires and related MPLS issues, and link layer technologies; (4) Operations and management area (ops), which focuses on network management, AAA and related protocols, including NETCONF,

[114] World Wide Web Consortium (W3C), "The W3C Technology Stack," (2 March 2010), available at http://www.w3.org/Consortium/techstack-desc.html.
[115] Internet 2011 in numbers, op. cit.
[116] *The Tao of the IETF*, available at http://www.ietf.org/tao.html.

SNMP,RADIUS, Diameter and CAPWAP, and various operational concerns of the Internet, such as DNS operations, IPv6 operations, security and routing operations; (5) Real-time applications and infrastructure area (rai), which focuses on development of protocols and architecture for delay-sensitive information, especially for industrial applications and services defined as "real time" such as voice and video over IP, instant messaging and presence services; (6) Routing area (rtg), which focuses on continuous operation of the Internet routing system by maintaining scalability and stability characteristics of existing routing protocols and developing, as appropriate, new protocols, extensions and bug fixes; (7) Security area (sec), which focuses on security protocols and technologies and whose activities intersect with all other IETF areas; and (8) Transport area (tsv), which focuses on technical issues and topics related to data transport on the Internet.[117]

b. IETF Engineering Steering Group (IESG) <http://www.ietf.org/iesg/>. IESG is responsible for technical management of IETF activities, the Internet standards process, and for actions associated with entry into and movement along the Internet "standards track," including final approval of specifications as Internet Standards and publication as an RFC [Request for Comments].

c. Internet Architecture Board (IAB) < http://www.iab.org/>. IAB serves as an IETF committee and as an advisory body of the Internet Society. Its responsibilities include architectural oversight of IETF activities, Internet Standards Process oversight and appeal, and appointment of the RFC Editor. IAB also is responsible for management of IETF protocol parameter registries.

d. Internet Research Task Force (IRTF) <http://irtf.org/>. IRTF promotes research on evolution of the Internet by creating Research Groups working on Internet protocols, applications, architecture and technology. Its focus is on long-term aspects of Internet architecture and standards, while IETF focuses on shorter-term issues related to engineering and standards setting.

e. Internet Research Steering Group (IRSG) <http://irtf.org/irsg>. IRSG manages IRTF Research Groups, which can convene workshops on research areas deemed important to the evolution of the Internet. IRSG reviews and approves documents published as part of the IRTF Document Stream.

f. RFC [Request for Comments] Editor
< http://www.rfc-editor.org/index.html>. The Request for Comments series includes technical and organizational documents on the Internet, including technical specifications and policy documents produced by the Internet Engineering Task Force. The RFC Editor is responsible for editing and publishing RFCs online. The RFC Editor maintains the master repository of RFCs and RFC meta-data, available at <http://www.rfc-editor.org/rfc.html>.

2. Electrical and electronics-related standards.

[117] Internet Engineering Task Force (IETF), "Areas,: available at http://www.ietf.org/iesg/areas.html.

a. Institute of Electrical and Electronics Engineers (IEEE) <http://www.ieee.org>. IEEE is an international technical association with the mission of fostering "… technological innovation and excellence for the benefit of humanity." IEEE has established working groups to develop standards on, among other topics, communications, computer technology, consumer electronics, and wired and wireless communications.

b. International Electrotechnical Commission (IEC) <http://www.iec.ch/>. IEC is a non-profit, non-governmental global organization that publishes consensus-based International Standards and manages conformity assessment systems for electric and electronic products, systems and services, collectively known as electrotechnology. IEC cooperates with ISO (International Organization for Standardization) and ITU (International Telecommunication Union) to ensure that International Standards fit seamlessly and complement each other.

3. Coordination and management of Internet Domain Names and IP [Internet protocol] addresses.

The Internet Corporation for Assigned Names and Numbers (ICANN) <http://www.icann.org/> is a non-profit corporation, incorporated 30 September 1998, which assumed responsibilities for a number of Internet-related tasks performed previously by the Internet Assigned Numbers Authority (IANA) under contract with the United States Department of Commerce, namely allocation, management and coordination of globally unique names and numbers used in Internet protocols. IANA now carries out these tasks as a department in ICANN.

ICANN is responsible for coordinating the Domain Name System (DNS), Internet Protocol (IP) addresses (both IPv4 and IPv6), space allocation, protocol identifier assignment, generic (gTLD) and country code (ccTLD) Top-Level Domain name system management, and root server system management functions to ensure stable and secure operation of the Internet.

While ICANN provides technical support for operations of DNS resources, namely the "IANA functions" of maintaining the central Internet address pools and DNS root registries, a current focus is DNS policy development, internationalization of the DNS system and introduction of new generic top-level domains (TLDs).

4. Web standards, and Web Accessibility Initiative.

The World Wide Web Consortium (W3C), defines itself as an "international community" comprised of member organizations (currently 346 worldwide),[118] full-time staff, and interested individuals and enterprises working on development and promotion of open standards and technical guidelines for long-term growth of the World Wide Web. A primary goal of W3C is to make the communications, commerce, and sharing of knowledge and ideas benefits of the World Wide Web

[118] As at 10 March 2012, see W3C Current Members, available at http://www.w3.org/Consortium/Member/List .

"available to all people whatever their hardware, software, network infrastructure, native language, culture, geographical location, or physical or mental ability."[119]

W3C distinguishes its concerns from the Internet Society and its subsidiary technical units as follows: the focus of ISOC is the Internet, a global network of networks defined by TCP/IP standards, while W3C is concerned with the World Wide Web, an "information space" in which items of interest, termed "resources," are identified by global identifiers called Uniform Resource Identifiers (URI). The first three specifications for Web technologies are defined URLs (Uniform resource locator), HTTP (Hypertext transport protocol), HTML (Hypertext markup language) and XML (Extensible markup language).[120]

ISOC consider its work complementary to W3C activities as reflected in their respective commitments to open technical standards, freely accessible processes for technology and policy development, and transparent and collaborative governance related to long-term development of the Internet and the World Wide Web.[121]

W3C launched its Web Accessibility Initiative (WAI) in 1997, as one of the four W3C domains, with the objective of developing standards and guidelines to make Web content accessible for people with disabilities. WAI accessibility guidelines and technical guidance documents address the following topics:

a. Web Content: Web Content Accessibility Guidelines (WCAG 2.0).[122] The document provides guidance in terms of 12 guidelines and four principles – perceivable, operable, understandable, robust - to make Web content more accessible to people with disabilities. Web "content" refers to the information in a Web page or Web application, such as text, images, forms, sounds.

b. Authoring Tools: Authoring Tool Accessibility Guidelines (ATAG 1.0 and ATAG 2.0 working draft). Authoring tools are software and services used to produce Web pages and Web content. ATAG 1.0 presents guidance in terms of 28 checkpoints on producing accessible output (Web pages), on prompting content authors for accessibility-related information, on providing way to check and correct inaccessible content, on integrating accessible designs into the overall "look and feel" of Web content, on making the authoring tool accessible to content authors with disabilities. ATAG 2.0 (working draft) is under development to be compatible to approved version of WCAG 2.0.

c. User Agent: User Agent Accessibility Guidelines (UAAG 1.0 and UAAG 2.0 working draft). The document provides guidance on making user agents - Web browsers, media players, and assistive technologies - accessible to persons with disabilities, particularly to increase accessibility of Web content. UAAG 1.0 presents checkpoints on (a) access to all Web content, including content tied to events triggered by a mouse or a keyboard, (b) on user control over how content is rendered, (c) on user control over the user

[119] W3C Mission, available at http://www.w3.org/Consortium/mission.html.
[120] W3C, "Help and FAQ,," available at http://www.w3.org/Help/.
[121] Internet Society, "FAQ about the Internet Society and W3C," available at http://internetsociety.org/faq-about-internet-society-and-w3c#alignment.
[122] Available at http:// www.w3.org/TR/WCAG20.

interface, and (d) on standard programming interfaces to enable interaction with assistive technologies. UAAD 2.0 (working draft) is under development to reflect latest Web browser technologies and to align content with draft ATAG 2.0, once approved, and the approved WCAG 2.0.

d. Evaluation Language: Evaluation and Report Language (EARL 1.0 working draft, 10 May 2011). EARL is a machine-readable format to express test results, which was developed by the Evaluation and Repair Tools Working Group of WAI to facilitate processing of test results using a vendor-neutral and platform-independent format. EARL allows Web authoring tools and quality assurance software to aggregate test results of different testing tools including Web accessibility evaluation tools, validators, and other content checkers. EARL uses the Resource Description Framework (RDF) to define terms for expressing test results.

e. Rich Applications: WAI-ARIA, the Accessible Rich Internet Applications Suite (WAI-ARIA 1.0 W3C candidate recommendation, 18 January 2011). The candidate recommendation discusses ways to make "rich" Web content and Web applications more accessible to people with disabilities; the focus of WAI-ARIA is on dynamic Web content and advanced user interface controls developed with Ajax, HTML, JavaScript, and related technologies. Certain functionality – rich Internet content - currently used in Web sites is not available to some users with disabilities, especially people who use screen readers or who cannot use a mouse pointing device. WAI-ARIA addresses such accessibility challenges, for example by defining new ways for functionality to be provided to assistive technologies so advance Web applications can be accessible and usable to persons with disabilities.

f. Mobile Web:[123] Mobile Web Best Practices 1.0 (MWBP 1.0, W3C recommendation 29 July 2008) and Mobile Web Application Best Practices (W3C Recommendation 14 December 2010). MWBP 1.0 provides guidance on design of mobile Web sites that deliver content appropriate for users of mobile devices guidance. The goal of MWABP is to aid development of rich and dynamic mobile Web applications. MWABP is based on contemporary engineering practices and focuses on those that enable a better user experience for all and identifies practices that can affect usability and accessibility.

MWBP 1.0 "Basic guidelines" notes that while the aim is to improve Web-based experiences on mobile devices, recommendations are made in the context of working towards *One Web*. "*One Web* means making, as far as is reasonable, the same information and services available to users irrespective of the device they are using… [I]t does not mean that exactly the same information is available in exactly the same representation across all devices… device capability variations, bandwidth issues and mobile network capabilities all affect the representation."[124]

[123] W3C Mobile Web Initiative, available at http://www.w3.org/Mobile/.
[124] W3C, Mobile Web Best Practices 1.0; *Basic Guidelines*. W3C Recommendation 29 July 2008, available at http://www.w3.org/TR/mobile-bp/#OneWeb.

Mobile Web standards have obtained considerable attention with the expansion of Mobile-first designs[125] that build on increased availability of affordable and reliable mobile bandwidth worldwide and expanded choice in smartphones, tablets and ultrabooks. Mobile-first design is associated with "responsive design,"[126] which refers to use of liquid layouts[127] and media queries that scale Web sites to respond to screen size and device capacities.

In response to these trends W3C released its draft specification of Cascading Style Sheets (CSS) Media Queries Level 4,[128] which provides guidance on a set of basic building blocks in responsive design.[129] These developments suggest that recommended mobile Web best practices and draft specifications can lead to significant improvements in accessibility and usability for all users.

3. Internet governance: a brief review

As a global network of networks, there are recurring questions about "Who controls the Internet."[130] As discussed, a number of international non-profit organizations, professional societies and technical bodies provide trans-border governance functions related to coordination and maintenance of domain names and IP registries, promote development and maintenance of Internet architecture, and prepare standards and technical guidance to ensure its stable and secure operation.

Since the Internet operates in sovereign national territories, national authorities have introduced policies, institutions, regulations and procedures to promote, guide and supervise Internet usage within their borders.

(a) Tunis Agenda

[125] Luke Wroblewski, "Mobile first," (3 November 2009), available at http://www.lukew.com/ff/entry.asp?933.
[126] Ethan Marcotte, "Responsive design," (25 May 2010), available at http://www.alistapart.com/articles/responsive-web-design/. See also Ethan Marcotte, *Responsive Web Design.* #4 (New York, A Book Apart, 2011).
[127] Liquid layout emerged as a replacement to HTML-based table layout as both design concept and coding practice in the design of Web sites that adapt to space available to display content. Liquid designs aim to provide similar experience to people and eliminate possible irritating design flaws, which affect usability and accessibility; see Carmen Mardiros,"Liquid design - a step forward to make your website accessible,' (n.d.) available at http://www.mardiros.net/liquid-design.html.
[128] W3C, Editor's Draft 19 June 2012, http://dev.w3.org/csswg/mediaqueries4/ .
[129] Scott Gilbertson, "It's official, CSS media queries are a Web standard," *Wired.* Webmonkey (20 June 2012), available at http://www.webmonkey.com/2012/06/its-official-css-media-queries-are-a-web-standard/.
[130] Jack Goldsmith and Tim Wu , *Who Controls the Internet?;illusions of a borderless world* (New York: Oxford University Press, 2006). The authors review the history of the "borderless" Internet, as at mid-2005, observe that the Internet is a communications medium and, like previous technologies, is not likely to displace territorial government, and discusses the need for an authority to enforce basic rules, for instance against theft, fraud and violence. They summarize their point: "Public goods and related virtues of government control of the Internet are necessary across multiple dimensions for the Internet to work, and as a practical matter only traditional territorial governments can provide such public goods." The book has been criticized as an example of the "new cyber-conservatism", noting that Goldsmith and Wu have neglected to consider the role of ICANN (Internet Corporation for Assigned Names and Numbers) as refutation of their claim that "only traditional territorial governments" can provide the governance needed to make the Internet work. See Milton L. Mueller, "A review of Goldsmith and Wu's 'Who Controls the Internet? Illusions of a Borderless World'" available at http://internetgovernance.org/pdf/MM-goldsmithWu.pdf.

Internet governance was a key theme of the outcome of the Second session of the World Summit on the Information Society (WSIS) (Tunis, 16-118 November 2005), the "Tunis Agenda for the Information Society."[131] The discussion of Internet governance in the Tunis Agenda reflects compromises on a number of complex technical, institutional and political issues on management and development of the Internet as a stable and secure global network of public and private sub-networks based on open standards. The Tunis Agenda "recognizes":

a) Policy authority for Internet-related public policy issues is the sovereign right of States. They have rights and responsibilities for international Internet-related public policy issues.
b) The private sector has had, and should continue to have, an important role in the development of the Internet, both in the technical and economic fields.
c) Civil society has also played an important role on Internet matters, especially at community level, and should continue to play such a role.
d) Intergovernmental organizations have had, and should continue to have, a facilitating role in the coordination of Internet-related public policy issues.
e) International organizations have also had and should continue to have an important role in the development of Internet-related technical standards and relevant policies.[132]

The Tunis Agenda "…reaffirm[s] … commitment to the freedom to seek, receive, impart and use information …for the creation, accumulation and dissemination of knowledge." But it provides no guidance on promotion and provision of accessible Internet resources.

The Tunis Agenda states that Internet governance is a more complex issue than coordination and management of names and addresses of Internet resources, since it involves both public policy concerns, which include security, safety and implications for development, and social, economic and technical issues, which include affordability, reliability and quality of service. The Tunis Agenda further notes that many international public policy issues concerning the Internet that require attention are not adequately addressed by current mechanisms, and "invites" the Secretary-General of the United Nations to convene a new forum for multi-stakeholder policy dialogue, on, among other issues, international public policy options to foster sustainability, robustness, security, stability and development of the Internet.[133]

(b) Multi-stakeholder forum: Internet Governance Forum (IGF)

The Secretary-General of the United Nations convened the first session of the "multi-stakeholder" Internet Governance Forum (IGF),[134] in 2006 at Athens (30 October - 2 November), with subsequent meetings being held annually. The IGF mandate was extended for an additional five years by the sixty-fifth session of the General Assembly (2010).[135]

Since Internet accessibility was not addressed in the Tunis Agenda, the question obtained episodic treatment in initial IGF meetings, where Internet access was the thematic priority in the light of its role in national development. IGF discussions focused on infrastructure, network technologies, regulatory regimes, pricing policies on connectivity and Internet-based

[131] Document: WSIS-05/TUNIS/DOC/6, available at http://www.itu.int/wsis/docs2/tunis/off/6rev1.html.
[132] Ibid., para.35.
[133] Ibid., paras. 58-60; 67; and IGF terms of reference, para72..
[134] <http://www.intgovforum.org/cms/>
[135] Resolution 65/141,operative paragraph 17.

services, and capacity building. When Internet accessibility arose, the view was expressed it was a matter associated with endpoints of the global Internet and not a core design concern.

This changed at the fourth meeting of IGF, in 2009 at Sharm El Sheikh, Egypt (15-18 November), when the "Access and diversity" session noted that Internet accessibility is a right guaranteed in the Convention on the Rights of Persons with Disabilities.[136]

At the sixth meeting of IGF, in 2011 at Nairobi (27-30 September 2011), the "Access and diversity" session explored ways in which access to the Internet can be understood as a human right. The view was expressed that access without accessibility is meaningless. IGF 6 participants noted that accessibility takes many dimensions including, inter alia, affordability, relevance, and design. The session outcome noted that Internet access and accessibility needed to be designed in products and services at the outset of the design and development process, and identified a number of incentives to promote Internet accessibility, which included appropriate national policies and legislation and support for new and expanded commercial, social and cultural opportunities through accessible Internet resources. IGF 6 further noted the importance of extending dialogue on Internet access, connectivity and accessibility to include issues such as freedom of expression and freedom of association.[137]

4.Selected trends in information and communication technologies

Information and communications technologies are contributing to profound social, economic, cultural, and civil and political changes worldwide. The pace of change is rapid and facilitated by ease of entry for participants due to (1) the open nature of Internet standards and technologies, (2) expansion of broadband resources worldwide – wired and mobile,[138] and (3) declining cost of Internet access, computing and storage resources. The pace of change makes trend assessment difficult;[139] and the innovations discussed below on use of Internet as a communications backbone and as a platform for application development may well be considered legacy experiences shortly. They are presented to underscore the need to plan for diversity among users to ensure accessible and usable Internet resources for all.

Expanding bandwidth capacities worldwide has resulted in the Internet displacing legacy telecommunications networks and serving as a prime global communications network supporting a range of services: voice and digital content, Internet-based services (public and private), and computer-mediated transactions, or the "Internet of Things (IoT)."[140]

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[136] Available at http://www.intgovforum.org/cms/2009-igf-sharm-el-sheikh .
[137] Chair's summary, available at http://www.intgovforum.org/cms/2011/summaries/2011.IGF.Nairobi.Chairs.summary.v.F1.pdf
[138] Data compiled by the World Bank and International Telecommunications Union indicate the number of individuals using the Internet has risen constantly since the late 1990s and reached an estimated 2.4 billion while the number of fixed (wired)-broadband subscriptions reached almost 600 million at the end of 2011, in *The Little Data Book on Information and Communication Technology 2012* (Washington, DC: World Bank, 2012).
[139] Jacques Bughin, Michael Chui and James Manyika, "Clouds, big data, and smart assets: ten tech-enabled business trends to watch," McKinsey Quarterly (August 2010). The authors note that since their first global survey in 2008, the number of registered users of the Facebook social media had quintupled to 500 million, more than 4 billion people use cellphones and 450 million of the cell phone users use the mobile Web.
[140] "Introduction, The Internet of Things Hub," available at http://www.internet-of-things.eu/; see also Hal R. Varian, "Computer Mediated Transactions," *Richard T. Ely Lecture*; American Economic Association Annual Meeting (Atlanta, 3-5 January 2010), available at http://people.ischool.berkeley.edu/~hal/Papers/2010/cmt.pdf (version 6 March 2010).

The emergence of the Internet of Things (IoT) involves a range of telemetry applications and digital devices that enable "smart communities" to monitor critical operations including transportation networks, vehicle usage, public services (energy usage, water and waste disposal). For enterprises, IoT provides support for a range of back-office functions, for improved supply chain management, and for Cloud-based support of business processes as a service rather at onsite data centres.[141] Associated with IoT usage is a growing body of data generated remotely by machines that must be compiled, analyzed, visualized and made available to decision support systems - ideally in accessible formats for all end users.

Expanded availability of reliable and cost-effective bandwidth worldwide has contributed to significant use of the World Wide Web as a platform for dynamic information creation and sharing, for expanded interoperability among diverse systems, for user-centered creation of products and services, for social communications, collaboration and networking on a range devices – from smartphones and tablets to ultrabooks, and legacy desktop computers.

The term "Web 2.0" often is associated with the evolution of the World Wide Web from a static collections of Hypertext Markup Language (text and graphical) content – or Web 1.0 - to a "transport mechanism through which interactivity happens."[142] In a developer note, the International Business Machines Corporation discusses the principles and practices that reflect changes in the way applications and information resources increasingly are assembled and published on the World Wide Web:

> "Web 2.0 applications tie together cooperative Internet services, integrate data syndication, and leverage collective intelligence … take advantage of the Web as a platform and enable users to assemble new, unique, and consumable applications."[143]

However, Sir Timothy Berners-Lee has described the term "Web 2.0" as jargon:

> "Nobody really knows what it means... If Web 2.0 for you is blogs and wikis, then that is people to people. But that was what the Web was supposed to be all along... Web 2.0, for some people, it means moving some of the thinking [to the] client side, so making it more immediate, but the idea of the Web as interaction between people is

[141] Kylie Wansink, *Global Internet of Things - A Business Game Changer* (Bucketty, NSW, Australia: Paul Budde Communication Pty, 17 August 2011), available at http://www.budde.com.au/Research/Global-Internet-of-Things-A-Business-Game-Changer.html; and Ibid., , *Global Telecoms - M2M a Key Global Trend* (Bucketty, NSW, Australia: Paul Budde Communication Pty,13 August 2012).

[142] Darcy DiNucci, "Fragmented Future," *Prin*t, vol. 53, no. 4 (July-August 1999) p. 32, 221-222, available at : http://www.darcyd.com/fragmented_future.pdf. The concept of Web 2.0 generally is associated with Ms. DiNucci, who in this July 1999 review of Web design and development trends used the term in her discussion of the "Web of the Future." The term has been popularized by O'Reilly Media through its publications and organization annually, from 2004, of Web 2.0 conferences; see Tim O'Reilly, "What Is Web 2.0; Design Patterns and Business Models for the Next Generation of Software (30 September 2005), available at http://oreilly.com/web2/archive/what-is-web-20.html; see also Tim O'Reilly and John Battelle, Web Squared: Web 2.0 Five Years On," Paper presented to *Web 2.0 Summit* (San Francisco: 20-22 October 2009), available at http://assets.en.oreilly.com/1/event/28/web2009_websquared-whitepaper.pdf.. See also Prashant Sharma, "Core Characteristics of Web 2.0 Services," *TechPluto* (28 November 2008) available at http://www.techpluto.com/web-20-services/.

[143] IBM, "Web 2.0 concepts and terms," (May 2011), available at http://publib.boulder.ibm.com/infocenter/dzichelp/v2r2/index.jsp?topic=%2Fcom.ibm.etools.info2.doc%2Fims_web20_terms.htm.

really what the Web is. That was what it was designed to be... a collaborative space where people can interact."[144]

Web 2.0 technologies do offer new and innovative communication and transaction opportunities, but they also introduce challenges in accessibility and usability. The potential of Web 2.0-based service offerings include: (1) new approaches and expanded opportunities for civil participation, (2) significant expansion for individual choice in access and use of service offerings – public and private[145] and (3) new forms of organization to conduct business processes – public and private - on a collaborative and interactive basis. Accessibility issues arise in the use of dynamic Web content in Web 2.0 resources, which rely on Rich Internet Application Architectures[146] that require browser plug-ins to execute and can pose challenges those who use assistive devices or rely on keyboard navigation.[147] Accessibility gaps in Rich Internet Applications relate to use of JavaScript[148] to render dynamic content,[149] which affects the ability of persons with disabilities to access dynamic Internet resources due to a lack of accessibility application programming interfaces that support interoperability with assistive devices to enable them to access rich, dynamic content with appropriate semantics needed to produce a usable alternative.

The accessibility gap in Rich Internet Applications is under continuing study by the Web Accessibility Initiative of the World Wide Web Consortium. The focus of WAI work on Accessible Rich Internet Applications is identification and development of W3C recommendations to address interoperability issues with assistive technologies and for users of keyboard navigation to provide guidance on recommended usage patterns for Web developers of dynamic content in creating accessible and usable resources for all.[150]

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[144] IBM, "developer Works Interviews: Tim Berners-Lee," *Podcast* (22 August 2006), available at http://www.ibm.com/developerworks/podcast/dwi/cm-int082206txt.html. See also Special issue: "Critical Perspectives on Web 2.0" in *First Monday*, Vol. 13, No. 3 (3 March 2008) available athttp://www.uic.edu/htbin/cgiwrap/bin/ojs/index.php/fm/issue/view/263/showToc.

[145] See for instance, Chris Anderson, *The Long Tail: why the future of business is selling less of more* (New York: Hyperion, 2006). Anderson argues that information technologies are contributing to declines in the cost of reaching consumers, which allows enterprises to shift from a one-size-fits-all model of mass marketing to marketing strategies that provide considerable variety for a range of unique tastes. See also Don Tapscott and Anthony D. Williams, *Wikinomics: How mass collaboration changes everything* (New York: Portfolio, 2006), and Ibid. *Macrowikinomics: New solutions for a connected planet* (New York: Portfolio, 2010) in which the authors discuss mass collaboration (peer production) and open-source technologies in business environments. The Wikinomics blog is available at http://www.wikinomics.com/blog/.

[146] Vaibhav V. Gadge, "Technology options for Rich Internet Applications," *IBM developer Works* (25 July 2006) available at http://www.ibm.com/developerworks/library/wa-richiapp/.

[147] W3C, "WAI-ARIA Primer 1.0; An introduction to rich Internet application accessibility challenges and solutions," (Editors' Draft 2 August 2010), available at http://www.w3.org/WAI/PF/aria-primer/.

[148] JavaScript, a dynamic scripting language, resides inside HTML documents to provide levels of interactivity to Web pages not achievable with simple HTML, see Oracle Corporation, "What is JavaScript and how is it different from Java Technology?" (n.d.) available at http://www.java.com/en/download/faq/java_javascript.xml. JavaScript is not "Interpretive Java", see Mozilla Foundation, "What is JavaScript?" (16 August 2012) available at https://developer.mozilla.org/en-US/docs/JavaScript/About_JavaScript?redirectlocale=en-US&redirectslug=About_JavaScript.

[149] StatOwl, an aggregator and publisher of Internet usage statistics, reports average Java usage at 71.04% as at July 2012, available at http://www.statowl.com/java.php.

[150] W3C, "WAI-ARIA Roadmap 1.0; W3C plans for addressing rich Internet application accessibility gaps," (Editors' Draft 15 December 2009) available at http://www.w3.org/WAI/PF/aria-roadmap/; Ibid, "Accessible Rich Internet Applications (WAI-ARIA) 1.0," (W3C Candidate Recommendation 18 January 2011), available at http://www.w3.org/TR/2011/CR-wai-aria-20110118/; Ibid., "WAI-ARIA 1.0 Authoring Practices; An author's guide to understanding and implementing Accessible Rich Internet Applications," (Editors' Draft 28 June 2012) available at http://www.w3.org/WAI/PF/aria-practices/.

User-created content and services based on a range of Internet-based resources - often termed "Web mash-ups" - respond to individual requests for information, for instance mapping a destination, are based on a set of concepts and principles termed Web-Oriented Architecture (WOA).[151] WOA refers to a software model in which the set of programs supporting distributed applications is stored on an Internet-based server rather than end-user computers; end users access the service through a Web browser using standard Internet protocols; services are platform and language independent, which ensures interoperability and functionality, which is replicable and reusable.[152] The accessibility challenge in WOA–based applications is to ensure that underlying functional building blocks provide accessibility options for a range of end users. For instance, the open source collections management information system for museums and other collecting institutions, Collection Space,[153] demonstrates how WOA-based solutions can provide accessibility with reasonable accommodation for those who use assistive technologies or prefer keyboard commands.[154] Collection Space is Web based; its collection management applications reside on a Web server to support mission-critical collections management and information support.

The social potential of Web 2.0 technologies means that individuals no longer are merely consumers - or occasional and non-interactive critics - of digital content but can be active participants using a range of online tools and platforms – increasingly characterized by mobile-first options – to share opinions, thoughts, experiences, technical knowledge and co-create value. The role of social media, such as Facebook, micro-blogs, such as Twitter, and interactive polling, such as Liquid Feedback, in civil and political dialogue is expanding rapidly worldwide and is well documented. Less well documented is the role of social media and micro-blogs in user-initiated responses to disasters and emergency situations.

Accessible and inclusive disaster response and emergency management was a priority theme of the 2012 United Nations expert meeting on accessible information and communication technologies, which studied the role of accessible ICT in responses to the March 2011 East Japan – Tohoku Region – earthquake and tsunami, the 2010 Haiti earthquake and reconstruction efforts, and the 2004 Aceh Province tsunami and 2006 Jogjakarta Province earthquake in Indonesia.[155] One lesson from the review was an accessibility challenge in many social media applications: user interfaces are not always accessible.[156]

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[151] Dion Hinchcliffe, "What Is WOA? It's The Future of Service-Oriented Architecture (SOA)," *Blog - Musings and Ruminations on Building Great Systems* (27 February 2008), available at http://hinchcliffe.org/archive/2008/02/27/16617.aspx; see also Dave West, "REST is a style -- WOA is the architecture," *InfoQ* (8 June 2009), available at http://www.infoq.com/news/2009/06/hinchcliffe-REST-WOA .

[152] FinES (Future Internet Enterprise Systems), "Service- oriented Architecture (SOA) and Web Services," (n.d.), available at http://www.fines-cluster.eu/fines/mw/index.php/Main_Page. FinES is supported by a Coordination and Support Action (CSA) project under the Seventh Framework Programme (FP7) of the European Commission.

[153] "About Collection Space," available at http://www.collectionspace.org/about. Collection Space is supported by a grant from the Andrew W. Mellon Foundation.

[154] "Collection Space is a Web-Oriented Architecture … Built using …[The] Fluid [Project's] Infusion application framework (jQuery-based) [and] …RESTful APIs exposing XML and JSON … Can accommodate diverse user needs; Works well with the keyboard, other assistive technologies; Accessible, but still rich and dynamic in Patrick Schmitz, "Collection Space Intro," (n.d.), available at http://courses.ischool.berkeley.edu/i290-rmm/s12/slides/Lecture2%20CSpace.pdf .

[155] *Report of United Nations Expert Meeting on Building Inclusive Societies…*, op. cit., pp. 21-25; 35-39.

[156] The Social Web Wiki, hosted by the World Wide Web Consortium (W3C), notes invalid markup and lack of consistent use of alt text and other accessibility issues with Twitter's Web site < http://twitter.com/ > means

Increased bandwidth and improved reliability in mobile bandwidth has contributed to consumerization of what once were enterprise-level information technology and communication devices.[157] This is reflected in the expanding range of innovative form factors - such as smartphones, tablets and ultrabooks - by which individuals can access, use, manipulate or create Internet resources for personal, official or commercial purposes. Expanded choice in device options brings new challenges for accessibility and usability. Participants at the 2012 United Nations expert meeting noted three reasons for an observed lag between introduction of new Internet-based services and provision of accessibility options: (1) some developers consider accessibility standards complex and difficult to understand; (2) some consider standards to be counter to technical advances; and (3) lack of awareness of relevant standards by some developers and Web content authors.[158] Participants took noted of the role that public procurement can play in promoting awareness of accessibility standards and in supporting development of assistive technologies.[159]

Public procurement and national legislation on accessible information and communication services evidently have influenced decisions by mobile device operating system publishers to support a range of accessibility options. Android, a Linux-based open-source set of software for mobile devices, comprised of an operating system, middleware and key mobile applications, [160] has supported accessibility features since Android release 1.6 on 15 September 2009. [161] Android is open-source code, which recipients can modify and redistribute, so telecommunication services and device manufacturers may create customized versions that test reports indicate do not always support Android accessibility capabilities.[162]

The iOS mobile operating system of the Apple Computer Corporation supports a range of accessibility features that enable persons with disabilities to use its iPhone, iPad and iPod

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persons with disabilities often access Twitter via third-party applications, available at http://www.w3.org/WAI/PF/wiki/Social_Web#Twitter_API_Clients_Used_by_Persons_With_Disabilities. These include: Qwitter < http://qwitter-client.net/ > which is a Twitter client designed for persons who are blind or have limited vision to interface Twitter micro-blogging services globally via a screen reader.
Easy Chirp < http://www.easychirp.com/ > which is a Web-accessible alternative to Twitter that is optimized for persons with disabilities: all links are keyboard accessible, simple, consistent layout and navigation is provided, each page includes helpful headings, audio cues indicate when Twitter's 140-character limit is almost reached, works with or without JavaScript, is compatible with major Internet browsers, and can be used by persons with disabilities and non-disabled persons alike.

[157] Chris Murphy, "9 Critical Trends for Innovative IT," *Informationweek* (19 September 2011), pp.13-18, available at http://www.informationweek.com/global-cio/interviews/9-critical-trends-for-innovative-it-info/231600919.

[158] *Report of United Nations Expert Meeting on Building Inclusive Societies…*, op. cit. p. 16.

[159] See Dónal Rice, "Framing Europe's ICT accessibility policy development in the first decade of the 21st century," (10 April 2012); paper presented to *United Nations Expert Group Meeting on Building Inclusive Society and Development through Promoting ICT Accessibility: Emerging Issues and Trends (Tokyo Japan, 19-21 April 2012)*, available at http://www.un.org/disabilities/documents/egm2012/DonalRice.doc.

[160] "Overview," (n.d.), available at http://www.openhandsetalliance.com/android_overview.html. Google Corporation provided initial support for Android development and purchased the product in 2005. Google released the Android code as open-source, under the "Apache License" of the non-profit Apache Software Foundation < http://www.apache.org/> , which grants recipients rights to modify and redistribute code.

[161] "Enabling Accessibility" (August 2010), available at http://eyes-free.googlecode.com/svn/trunk/documentation/android_access/enabling.html.

[162] in "API Guides; Accessibility," (14 August 2012), available at http://developer.android.com/guide/topics/ui/accessibility/index.html.

touch devices. These include a screen reader for blind and low vision users, dynamic screen magnification, playback of closed-captioned video, mono audio and reverse video.[163]

Microsoft Windows Phone 8 software provides accessibility features through a single "ease of access" setting.[164] The Microsoft Developer Center hosts an Accessibility resource page.[165]

5. Implications for provision of accessible and usable Internet resources

Provision of accessible and usable Internet-based services and resources will be examined with reference to three issue clusters: (a) data and information as transformative agents; (b) ubiquity of Internet services and resources and implications for accessibility; and (c) compliance and enforcement of accessibility standards.

(a) Data and information as transformative agents

Writing in the January – February 1988 edition of the *Harvard Business Review*, the late Professor Peter Drucker noted that "modern" businesses have little choice but to become information based, to engage in analysis and diagnosis or risked being swamped by the data being generated. He added that "building the information-based organization … is the managerial challenge of the future."[166]

A significant evolution in data, information technologies and digital processes has occurred since Professor Drucker's 1988 article on managerial issues and challenges of building "information-based" organizations of the future. Data and information were no longer considered transactional elements but transformative agents that influence organizational structures, functions and processes.

Developments in Internet infrastructure and Web 2.0-related technologies for content creation and management have resulted in new sources of contextual data on end-user characteristics, content access locations, remote payment options, and end-user created content in the form of real-time commentary on social media and micro-blogs, of audio and video content - original and remixed, of location-based searches, and "tagging" and cross-posting of selected content.

The evolution of data, in terms of structure, complexity, dynamic updates, and volume, with the expansion of Web 2.0-related technologies is not necessarily a new challenge in managing "big data," since technologies to manage large data sets by massively parallel processing date from the pre-Internet 1980s. Current challenges in "big data" are being addressed through breakthroughs in open-source distributed data processing components to

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[163] "iOS Accessibility," (2012), available at https://developer.apple.com/technologies/ios/accessibility.html. Technical details are provided in *iOS Human Interface Guidelines*(14 August 2012), which provide guidelines and principles to assist developers in designing user interfaces for iOS applications, available athttps://developer.apple.com/library/ios/#documentation/UserExperience/Conceptual/MobileHIG/Introduction/Introduction.html; and *Accessibility Programming Guide for iOS* (16 February 2012), which provides guidance on design and testing of accessible iOS applications, available at https://developer.apple.com/library/ios/#documentation/UserExperience/Conceptual/iPhoneAccessibility/Introduction/Introduction.html.

[164] " Ease of access settings improve Windows Phone 8 accessibility," (2012) available at http://allaboutwindowsphone.com/flow/item/15887_Ease_of_access_settings_improv.php.

[165] "Accessibility overview," available at http://msdn.microsoft.com/en-us/windows/bb735024.aspx.

[166] Peter F. Drucker, "The coming of the new organization," *Harvard Business Review*, January - February 1988 pp. 3-11, available at http://home.base.be/vt6195217/neworganization.pdf.

store, manage and process large volumes of structured, semi-structured and unstructured data, such as Hadoop.[167] This has contributed to new and expanded analytical capacities to study such dynamic and data-intensive fields as retailing, social-cultural issues and politic affairs.

Some associate these new analytical capacities based on open-source data processing components with emerging "Web 3.0" technologies[168] and the expanded production of recommendation algorithms to provide end users with personalized information products and recommendations on options considered appropriate to a computer-based end-user profile of preferences, purchases and use of Internet resources. This trend has introduced privacy as well as accessibility concerns, particularly by the European Union.[169]

Hadoop's open-source basis and ability to share applications across multiple nodes makes it a prime candidate for a range of clustered and distributed architectures. Its growing presence begs questions about accessibility in Hadoop-based frameworks. While Hadoop has significant large scale analytical capacities, it lacks a graphical interface. Third-party vendors are developing and publishing extensions to edit and run Extract, Transform and Load (ETL) database processes, data analytics and machine learning processes over Hadoop, but there is no evidence of attention directed to interoperability with assistive devices and procedures.[170]

Enhanced capacities for end-user content creation in real time have also resulted in new and expanded opportunities for new and more flexible forms of organizational structure in which remote collaboration plays a key role in decision making at all levels and in co-creation of products and delivery of services on a decentralized basis. Some have termed this trend "Enterprise 2.0," described as "use of emergent social software platforms within companies, or between companies and their partners or customers."[171] However, it is important to recall that collaboration technologies are neutral tools and cannot guarantee success of any particular collaboration and consultation initiative, which generally result from task-specific incidenst, institutional "cultural" and "informal" information pathways.[172] Social networking

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[167] Hadoop Wiki available at http://wiki.apache.org/hadoop/FAQ .

[168] Some associate the term "Web 3.0" with the Semantic Web as discussed by Sir Timothy Berners-Lee. Sir Timothy is of the view that the Semantic Web is a place where machines can read Web pages much as do end users, where search engines and software agents are better able to search for desired content that can the individual user; see "The Semantic Web Wiki" <http://www.w3.org/2001/sw/wiki/Main_Page>. Others are of the view that the need is to develop and test software agents that can better understand Web pages as they exist today and can guide end-users to resources related to past browsing, comments and consumption patterns.

[169] European Commission, *Comparative study on different approaches to new privacy challenges, in particular in the light of technological developments*. Final report (20 January 2010), available at http://ec.europa.eu/justice/policies/privacy/docs/studies/new_privacy_challenges/final_report_en.pdf.

[170] For instance Rapid-I-GmbH has published a RapidMiner extension for use with Hadoop, Radoop, which is an open-source data mining and analysis systems and uses Standardized XML interchange format for processes, see http://rapid-i.com/component/option,com_frontpage/Itemid,1/lang,en/. Extensible Markup Language (XML) is the W3C recommended meta-language for the Web, see W3C, "Extensible Markup Language (XML) 1.0 (Fifth Edition)," *W3C Recommendation* 926 November 2008), available at http://www.w3.org/TR/2008/REC-xml-20081126/ . XML facilitates accessibility through transformable, structured, text-based content and allows a range of flexible style sheet transformations.

[171] Andrew McAfee, available at http://andrewmcafee.org/2006/05/enterprise_20_version_20/.; see also Andrew McAfee, *Enterprise 2.0: new collaborative tools for your organization's toughest challenges* (Boston: Harvard Business School Publishing, 2009).

[172] Jacques Bughin, Michael Chui, James Manyika, *Clouds, big data, and smart assets: Ten tech-enabled business trends to watch,"*(McKinsey Global Institute, 22 September 2010), available at http://www.mckinsey.com/Insights/MGI/In_the_news/Clouds_big_data_and_smart_assets .

is people-driven; technological underpinnings are a secondary consideration.[173] For some enterprises such legacy communication applications as electronic mail continue to meet internal collaboration and consultation processes. The question of more comprehensive approaches arise when collaboration and consultation involves customers, clients and partners. The challenge in developing and deploying collaboration applications, particularly when this includes rich content - dynamic and interactive as well as mobile workforce applications - is ease of use and accessibility for a range of end users. Moreover, leveraging consumer-based applications such as Facebook in a corporate setting must deal with the Facebook business model, which is based on collecting and aggregating end-user data and preferences for sale to advertisers, which can compromise corporate security. Corporate-oriented applications such as Chatter, from Saleforce.Com,[174] and Yammer[175] introduce learning curve issues for those familiar with commercial social networking resources. Available data suggest neither application provides an accessible portal.

Wikipedia, Facebook and Twitter are well-documented examples of distributed co-creation and maintenance of content, and each provides examples of the role of accessible content. The Twitter micro-blogging service is text based but also supports cross-referencing of video content which may not be accompanied by alternative explanatory text. Easy Chirp <http://www.easychirp.com/> provides a Web-accessible alternative to Twitter.com.

Similar considerations relate to Facebook <http://www.Facebook.com/> and related social media, whose end-users may not be aware of guidance available on creation and maintenance of accessible content. Facebook does provide content in HTML at its mobile site and offers audio *captcha*[176] alternatives to written *captcha* to enable screen reader users to register.[177]

(b) Ubiquity, and reconsidering place and distance

Writing over 20 ago about the hypertext and Internet technologies project at CERN, Sir Timothy Berners-Lee described the aim of the World Wide Web as linking and accessing information of various kinds as a "web of nodes in which the user can browse at will."[178] The number of Web sites has expanded significantly since publication of the first Internet resource by CERN in August 1991. A major change in Internet resources in the twenty-first century is rapid growth in mobile Internet resources, which as at end-2011 accounted for over one-half of all broadband subscribers. Web 2.0 technologies have contributed to expanded opportunities to access digital content anywhere at any time, and introduced changes in ways that Internet content and services are created, used, repackaged, reposted or retransmitted.

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[173] See Anthony J. Bradley and Mark P. McDonald, *The social organization; how to use social media to tap the collective genius of your customers and employees* (Boston, Harvard Business School Publishing, 2011).
[174] Chatter overview <http://www.salesforce.com/chatter/overview/>.
[175] Yammer overview <https://www.yammer.com/product>
[176] CAPTCHA (for Completely Automated Public Turing Test To Tell Computers and Humans Apart) is a program that protects Web sites against computer-based bots by generating and grading tests that humans can pass but current computer programs cannot, available at http://www.captcha.net/.
The CAPTCHA organization notes: CAPTCHAs must be accessible. CAPTCHAs based solely on reading text — or other visual-perception tasks — prevent visually impaired users from accessing the protected resource and may make a site incompatible with Section 508 in the United States. A CAPTCHA should allow blind users to get around the barrier, for example, by permitting users to opt for an audio or sound CAPTCHA.
[177] "Using Facebook with Screen Readers and Other Assistive Technology," available at http://www.Facebook.com/help/?page=155475781184925.
[178] T. Berners-Lee; R. Cailliau, "WorldWideWeb: Proposal for a HyperText Project," (12 November 1990), available at http://www.w3.org/Proposal.html.

Change also is occurring in browser use in the World Wide Web application space, where there is a growing presence of mobile-first resources that require specialized applications to access, manipulate and create mobile content on smartphones and tablet devices.[179] This is not to suggest that the World Wide Web application space on the Internet is no longer a significant resource, but the growing presence of Cloud-based services and resources and proliferation of mobile content capture devices suggest that a Web presence for many developers is a secondary consideration. Micro-blogging resources such as Twitter rely more on a mobile presence than a Web site alone. A number of social networking applications are mobile-first resources[180] since they allow: (1) a clear path to end users, (2) creation of user-defined, self-contained social networks and (3) expanded opportunities for end users to access content in a device-agnostic manner. Web sites associated with mobile-first products and services now mainly exist to support downloads of applications and service patches.

Mobile-first accessibility issues are not easily answered. The set of Mobile Web Best Practices compiled by W3C focus on creation of usable mobile content; compliance with Web Content Accessibility Guidance is an ancillary concern due to an absence of relevant regulatory oversight.

(c) Compliance and enforcement

Compliance with policy and regulatory guidance often is viewed as a cost of operations. The less frequently asked question is "how to" achieve regulatory intent in an efficient manner.

With increased attention being directed to reducing administrative overheads, there is growing interest in common sets of principles, generally accepted standards, rationalized and coordinated approaches to lower the costs of oversight, risk management and audits.

In many countries Internet accessibility is a requirement of national law: public Internet resources must provide accessibility with reasonable accommodation; and enterprises that engage in commerce with public entities must provide accessible portals, and facilities providing public accommodations must provide accessible portals and offer essential information in accessible formats. There is growing recognition that provision and maintenance of accessible Internet resources add value to product and service offerings – public and private. Data compiled by the United Kingdom-based "AbilityNet" advocacy group suggest that provision of accessible information resources on products and services contributes to increased market share and long-term, stable consumer relationships.[181]

The Uniform Compliance Framework (UCF) <https://www.unifiedcompliance.com/>, based in the United States, is a recent approach to reducing the costs of complying with the range of regulatory guidance in the field of information technologies. UCF is based on an analysis of more than 700 information technology "authority documents" which include audit guidelines, contractual obligations, laws, standards and related instructions and compilation in an online

[179] *EWeek*, "Mobile-centric computing: how mobile devices, apps are creating a new Web," (2012-0104) available at http://www.eweek.com/c/a/Mobile-and-Wireless/MobileCentric-Computing-How-Mobile-Devices-Apps-Are-Creating-a-New-Web-877940/. See also Michael Hirschorn, "Closing the digital frontier," *The Atlantic* (July/August 2010) , available at http://www.theatlantic.com/magazine/archive/2010/07/closing-the-digital-frontier/8131/.

[180] Path, an application that creates an instant social network from the address book on an mobile telephone only uses it Web site for application downloads, https://path.com/.

[181] See "AbilityNet spearheads new accessibility campaign," (22/02/2010) available at http://www.abilitynet.org.uk/newsarticle88. AbilityNet is a United Kingdom-based pan-disability charity.

database. UCF is a subscription-based service to assist enterprises and organizations identify regulatory controls that need to be instituted to comply with relevant rules, standards and policies. A search of the term "accessibility" in the UCF Compliance Dictionary indicates that accessibility guidance is available to UCF subscribers:

> "Verify applications and Operating Systems meet the accessibility standards for disabled individuals …"[182]

The UCF experience suggests an approach interested regulatory authorities and audit and oversight organizations could consider when developing online resources on guidance documents, principles, standards and regulations both to lower operational costs and to add value to measures for promoting, providing and maintaining accessible Internet resources.

6. Select review of regulatory guidance and technical standards concerning accessibility on the Internet

The World Wide Web Consortium (W3C) has identified a set of components on Web development and end-user interactions that should work together for Web accessibility:[183]

(1) Web site content: use of natural information (text, images and sound), and markup code that defines its structure and presentation;
(2) User agents: Web browsers and media players;
(3) Assistive technologies: screen readers and input devices used in place of conventional keyboard and mouse pointing devices;
(4) User knowledge and experience: use of Web resources, and adapting strategies;
(5) Developers: content producers, including end-user created content;
(6) Authoring tools and related software: creating Web sites and content;
(7) Evaluation tools for Web accessibility: HTML validators, CSS validators;
(8) Web accessibility: standard, or policy to evaluate accessibility characteristics.

Three sets of regulatory guidance on design, provision and maintenance of accessible and usable Internet resources often are cited as examples of current good practice

> (1) United States Rehabilitation Act of 1973, section 508, as amended by the Workforce Investment Act of 1998;
> (2) Web Content Accessibility Guidelines 2.0, published as World Wide Web Consortium "Recommendation" on 11 December 2008; and
> (3) Technical report ISO/IEC TR 29138-2:2009 (parts 1-3), "Information technology: accessibility considerations for people with disabilities," prepared by the Special Working Group on Accessibility (SWG-A) of Joint Technical Committee 1 (JTC 1) of the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC).

(a) United States: Section 508 of the Rehabilitation Act[184]

Standards issued by the United States Access Board under Section 508 of the Rehabilitation Act cover access to electronic and information technology procured by Federal agencies.

[182] Search result available at http://www.unifiedcompliance.com/search/node/accessibility.
[183] Essential components of Web accessibility available at http://www.w3.org/WAI/intro/components.php.
[184] < http://www.section508.gov/index.cfm>.

Standards define technologies covered and present provisions to establish a minimum level of accessibility, which include:

(1) software applications and operating systems,
(2) web-based information or applications,
(3) telecommunication products ,
(4) video and multimedia products,
(5) self contained, closed products (e.g., information kiosks, calculators, and fax machines), and
(6) desktop and portable computers.

The current set of standards (published in the US Federal Register on 21 December 2000) draw significantly on Web Content Accessibility Guidelines 1.0 (published in May 1999) with some exceptions reflecting their application by Federal agencies in the United States. The standards currently are under review in response to changing technologies and to align them more closely with Web Content Accessibility Guidelines 2.0.

Exceptions to WCAG 1.0 priority 1 provisions include:

(1) Natural language: WCAG 4.1 – clearly identify changes in the natural language of a document's text and any text equivalents. The US Access Board was of the view that not many assistive technologies support language change markup and did not include the provision.
(2) Dynamic content; WCAG 6.2 - ensure that equivalents for dynamic content are updated when the dynamic content changes. The US Access Board was of the view the guidance was not clear.
(3) Clear language: WCAG 14.1 - use the clearest and simplest language appropriate for a site's content. The US Access Board was of the view that the provision would be difficult to enforce since language clarity is subjective.

Section 508 requirements US Federal agencies must follow when producing accessible Web resources include:

(1) A text equivalent for every non-text element shall be provided (e.g., via "alt", "longdesc", or in element content).
(2) Equivalent alternatives for any multimedia presentation shall be synchronized with the presentation.
(3) Web pages shall be designed so that all information conveyed with color is also available without color, for example from context or markup.
(4) Documents shall be organized so they are readable without requiring an associated style sheet.
(5) Redundant text links shall be provided for each active region of a server-side image map.
(6) Client-side image maps shall be provided instead of server-side image maps except where the regions cannot be defined with an available geometric shape.
(7) Row and column headers shall be identified for data tables.
(8) Markup shall be used to associate data cells and header cells for data tables that have two or more logical levels of row or column headers.
(9) Frames shall be titled with text that facilitates frame identification and navigation.

(10) Pages shall be designed to avoid causing the screen to flicker with a frequency greater than 2 Hz and lower than 55 Hz.
(11) A text-only page, with equivalent information or functionality, shall be provided to make a Web site comply with the provisions of this part, when compliance cannot be accomplished in any other way. The content of the text-only page shall be updated whenever the primary page changes.
(12) When pages utilize scripting languages to display content, or to create interface elements, the information provided by the script shall be identified with functional text that can be read by assistive technology.
(13) When a Web page requires that an applet, plug-in or other application be present on the client system to interpret page content, the page must provide a link to a plug-in or applet that complies with [Sec 508] §1194.21(a) through (l).
(14) When electronic forms are designed to be completed on-line, the form shall allow people using assistive technology to access the information, field elements, and functionality required for completion and submission of the form, including all directions and cues.
(15) A method shall be provided that permits users to skip repetitive navigation links.
(16) When a timed response is required, the user shall be alerted and given sufficient time to indicate more time is required.

(b) W3C: Web Content Accessibility Guidelines 2.0[185]

Web Content Accessibility Guidelines (WCAG) 2.0 cover a wide range of recommendations to make Web content accessible to a range of people with disabilities, including blindness and low vision, deafness and hearing loss, learning disabilities, cognitive limitations, limited movement, speech disabilities, photosensitivity, or combinations thereof.

WCAG 2.0 is based on four principles, which provide the foundation for Web accessibility:

a. Principle 1: Perceivable - Information and user interface components must be presentable to users in ways they can perceive.
b. Principle 2: Operable - User interface components and navigation must be operable.
c. Principle 3: Understandable - Information and the operation of user interface must be understandable.
d. Principle 4: Robust - Content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including assistive technologies.

WCAG 2.0 provides 12 guidelines that authors should follow to make Web content accessible to users with different disabilities.

1.1 Provide text alternatives for any non-text content so it can be changed into other forms people need such as large print, Braille, speech, symbols, pictures or simpler language;
1.2 Provide synchronized alternatives for multimedia;
1.3 Create content that can be presented in different ways (for example spoken aloud, simpler layout, etc.) without losing information or structure;
1.4 Make it easier for people with disabilities to see and hear content including separating foreground from background;

[185] <http://www.w3.org/TR/WCAG/>.

2.1 Make all functionality available from a keyboard;
2.2 Provide users with disabilities enough time to read and use content;
2.3 Do not create content that is known to cause seizures;
2.4 Provide ways to help users with disabilities navigate, find content and determine where they are [located on the site];
3.1 Make text content readable and understandable;
3.2 Make Web pages appear and operate in predictable ways;
3.3 Help users avoid and correct mistakes that do occur;
4.1 Maximize compatibility with current and future user agents, including assistive technologies.

WCAG 2.0, issued as a W3C Recommendation in 2008, is the basis of national guidance documents on providing accessible Web resources in many countries and territories.[186]

Country or territory	Reference document	National regulation
Australia	WCAG 2.0 AA	Disability Discrimination Act[187]
Canada	WCAG 2.0 AA	Human Rights Act 1977[188]
European Union	WCAG 1 AA	European Parliament Resolution (2002) 0325[189]
France	Référentiel Général d'Accessibilité pour les Administrations (RGAA) 2.2.1[190] (based on WCAG 2.0)	L'article 47 de la loi n° 2005-102 du 11 février 2005[191] Le décret n°2009-546 du 14 mai 2009[192]
Germany	Barrierefreie-Informationstechnik-Verordnung - BITV 2.0[193] (based on WCAG 2.0)	Behindertengleichstellungsgesetz – BGG (Equal Opportunities for Disabled People Act)[194]
Hong Kong, Special	WCAG 1 AA	Digital 21 Strategy (2008)[195]

[186] Data in the table draw upon Mark Rogers, "Government accessibility standards and WCAG 2.0," (November 7, 2011), available at http://blog.powermapper.com/blog/post/Government-Accessibility-Standards.aspx, and selected online resources for updates.
[187] Australian Human Rights Commission, *Disability Discrimination Act Advisory Notes*. Version 4.0, available at http://www.hreoc.gov.au/disability_rights/standards/www_3/www_3.html.
[188] Canadian Human Rights Act prohibits discrimination on the grounds of disability, available at http://www.chrc-ccdp.ca/about/human_rights_act-eng.aspx. . The Communications Policy of the Government of Canada is the official Treasury Board of Canada Secretariat (TBS) policy governing how federal departments and agencies communicate with Canadians. Recognizing the special needs of many Canadians, including literacy levels and perceptual or physical challenges, the policy requires that multiple formats be provided to ensure equal access to public information.
[189] Available at http://www.w3c.it/documents/EU2002(0325).pdf. The European Union "Web Accessibility Policy" Portal states: All the official websites of EU institutions should follow international guidelines for accessible web content, so they can be accessed and understood by as many people as possible without discrimination. The guidelines we aim to follow are the Web Content Accessibility Guidelines (version 1.0), available at http://europa.eu/geninfo/accessibility_policy_en.htm.
[190] http://www.references.modernisation.gouv.fr/rgaa-accessibilite.
[191] *Loi n° 2005-102 du 11 février 2005 pour l'égalité des droits et des chances, la participation et la citoyenneté des personnes handicapées*, available at http://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000000809647&dateTexte=
[192] Décret n° 2009-546 du 14 mai 2009, available at http://www.legifrance.gouv.fr/affichTexte.do?cidTexte=LEGITEXT000020626623&dateTexte=20091028.
[193] http://www.gesetze-im-internet.de/bitv_2_0/index.html.
[194] http://www.gesetze-im-internet.de/bundesrecht/bgg/gesamt.pdf.
[195] http://www.digital21.gov.hk/eng/index.htm.

Administrative Region of China		
Ireland	WCAG 1.0	The Disability Act 2005[196]
Italy	Technical Rules of Law 4/2004 (based on WCAG 1 AA)	Law No. 4/2004 ("Stanca" Law)[197]
Japan	Japanese Industrial Standard (JIS) X8341[198] (based on WCAG 2)	No legislation; accessibility guidance provided in JIS X8341.
New Zealand	WCAG 2.0 AA	Human Rights Amendment Act 2001[199]
United Kingdom	WCAG 1.0 AA	Equality Act 2010[200]
United States	Section 508 (based on WCAG 1.0; under review)	Section 508 of the Rehabilitation Act of 1973, as amended[201]

(c) JTC 1 Special Working Group on Accessibility[202]

Joint Technical Committee 1 (JTC 1) is a collaborative effort by the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) to deal with information technology standards where there is overlap between ISO and IEC. JTC 1 created a Special Working Group on Accessibility (SWG-A) in October 2004 to review accessibility standard activities in ISO, IEC, ITU, national and regional standards bodies, consortia, and user groups. The results of the reviews were published by ISO in June 2009 in three technical reports on accessibility and information technology.

- ISO/IEC TR 29138-1:2009, Information technology — Accessibility considerations for people with disabilities — Part 1: User needs summary. The report identifies a set of end-user accessibility needs for information technology products and services and relates these accessibility needs to the accessibility factors for standards developers to consider, which are presented in ISO/IEC Guide 71 (*Guidelines for standardization to address the needs of older persons and people with disabilities*).[203]

- ISO/IEC TR 29138-2:2009, Information technology — Accessibility considerations for people with disabilities — Part 2: Standards inventory. The report identifies major standards developed by various organizations that deal with information technology

[196] http://www.irishstatutebook.ie/2005/en/act/pub/0014/index.html.
[197] Law n. 4, January 9, 2004, available at http://www.pubbliaccesso.gov.it/normative/law_20040109_n4.htm.
[198] "Guidelines for older persons and persons with disabilities—Information and communications equipment, software and services," which has five components : (1) Common Guidelines (JIS X 8341-1: 2004); (2) Information Processing Equipment (JIS X 8341-2: 2004); (3) Web Content (JIS X 8341-3: 2004); (4) Telecommunications Equipment (JIS X 8341-4: 2005): (5) Office Equipment (JIS X 8341-5: 2006); see Web Accessibility in Japan," available at http://www.evengrounds.com/blog/web-accessibility-in-japan.
[199] http://www.legislation.govt.nz/act/public/2001/0096/1.0/whole.html.
[200] http://www.direct.gov.uk/en/DisabledPeople/RightsAndObligations/DisabilityRights/DG_4001068.
[201] http://www.section508.gov/.
[202] ISO/IEC TR 29138 Parts 1 – 3, available at http://www.jtc1access.org/TR29138.htm. The documents are provided as a single-user, non-revisable Adobe Acrobat® PDF file. Under no circumstances may the electronic file be copied, transferred, or placed on a network of any sort without the authorization of the copyright owner.
[203] Draft (2000-12-17) available at http://www.cettico.fi.upm.es/aenor/BTWG101-5(Sec)22.pdf ; document ISO/IEC Guide 71:2001 available at http://www.iso.org/iso/catalogue_detail?csnumber=33987.

related accessibility in whole or in part. The report identifies problems that people with disabilities may experience with information technologies that lead to user needs issues and identifies the relationship of these user needs with the accessibility factors for standards developers to consider presented in ISO/IEC Guide 71.

- ISO/IEC TR 29138-3:2009, Information technology — Accessibility considerations for people with disabilities — Part 3: Guidance on user needs mapping. The report provides guidance on mapping end-user needs to existing standards and on reporting and/or combining the results of such mappings. It provides basic guidance to be used for all user needs mapping and optional guidance that may be added to the basic guidance. The report notes that user needs mapping is a voluntary activity intended to help improve accessibility for all users and in particular for users with special needs that might otherwise be overlooked. User needs mapping is not intended to be used to evaluate, certify, or otherwise judge a given standard or set of guidelines.

The Special Working Group on Accessibility (SWG-A) meets twice a year, where it reviews and considers updates to its information technology accessibility technical reports. SWG-A encourages submission of accessibility specifications to ISO-IEC Joint Technical Committee 1 through: (1) traditional standards development process of ISO and IEC, (2) Publicly Available Specification (PAS) transposition process, and (3) Fast Track Process, in which SWG-A encourages National [Standards] Bodies to seek additional input from the concerned user community on fast-tracked accessibility standards.

IV. Accessibility in the general systems of society: issues, and options for the way forward

A. Options for post-2015 international development frameworks

Normative guidance on accessibility and development comes mainly from international disability instruments. The Preamble to the Convention on the Rights of Persons with Disabilities emphasizes the "importance of mainstreaming disability issues as an integral part of relevant strategies of sustainable development." However, advancement of persons with disabilities was not considered by the Millennium Declaration, considered in its "road map" for implementation[204] or addressed in five-year implementation reviews by the General Assembly.[205] Normative guidance was enhanced with adoption by the United Nations Human Rights Council, at its twentieth regular session (18 June - 6 July 2012), of a resolution concerning "human rights and the Internet."

The challenge becomes one of initiating dialogue on options for post-2015 international development strategy that includes options to promote accessibility in the general systems of society as a precondition for inclusive, sustainable and equitable development and poverty eradication. One consideration is a need to view accessibility as an investment in a global public good that contributes to effective, sustainable and equitable development for all and not cost of complying with non-discrimination policies and legislation. This will involve fundamental reconsiderations of policies that address the objective of equalization of

[204] *Road map towards the implementation of the United Nations Millennium Declaration; report of the Secretary-General*; Annex: "Millennium Development Goals". (United Nations document, no. A/56/326).
[205] General Assembly resolution 60/1, and resolution 65/1, respectively.

opportunities for persons with disabilities, as a targeted group, and to focus on measures that contribute to accessibility to the general systems for all. Dialogue should address policy options that promote: (a) progressive removal of barriers to opportunities for all to participate on the basis of equality as development agent and beneficiary and (b) mainstreaming and empowerment of persons with disabilities – women and men alike – in development.

Basic economics posits that any barrier to development participation – of a physical, technological, cultural or institutional nature – affects efficient allocation of resources, organization of production, exchanges, consumption, and distribution of benefits.

B. A global public good

The review further suggested that: (1) accessibility technologies are always under development, (2) accessible environments benefit all, and (3) accessible and usable products and services build market share and strengthen user interest and loyalty.

Expanded choice in accessible and usable goods and services for all has resulted from public procurement provisions that require public resources acquire products and services that are accessible for a wide range of end users, are usable and offer ease of use. [206] Public-private sector cooperation, reflected in policy incentives, demonstration grants and tax relief for accessibility and usability research in the "public interest," has resulted in commoditization of products that once were produced in response to non-discrimination provisions. Market-based approaches to provision of accessible and usable goods and services also reflect a shift in enterprise strategies from complying with non-discrimination measures to meeting capacities and interests of a diverse community of end users to build market share, enhancing individual choice and strengthening end-user involvement and experiences in product development and use.

The review concluded that accessibility is a member the set of global public goods, since (1) accessible and usable environments are non-excludable, which is to say accessibility benefits all; (2) use of accessible environments is non-rivalrous, which is to say use of accessible and usable goods services by one person does not detract from use by others; and (3) accessibility to the general systems of society enables the many to participate on the basis of equality.

Some may argue this is uncharted policy terrain. Much contemporary development dialogue considers environmental accessibility a question best addressed by the Convention on the Rights of Persons with Disabilities rather than as a core issue for development policy.

[206] Environmental accessibility public procurement regulation include: (1) European Commission (EC) Mandate M- 376 (7 December 2005) requires the three European standards organisations, CEN – European Committee for Standardization, CENELEC – European Committee for Electrotechnical Standardization, and ETSI – European Telecommunications Standards Institute, to harmonize and facilitate public procurement of accessible information and communication technologies (ICTs) products and services within Europe. CEN and CENELEC issued in November 2011 a draft European Standard (EN) on European accessibility requirements for public procurement of ICTs products and services for comment (until 31 December 2011), " Human Factors (HF); Accessibility requirements for public procurement of ICT products and services in Europe,"(ETSI EN 301 549 V0.0.34 (2011-11)) , available at http://www.mandate376.eu/; and (2) United States Access Board issued in December 2011 for public comment a revised draft of updated accessibility requirements for information and communication technology (ICT) covered by Section 508 of the Rehabilitation Act and Section 255 of the Telecommunications Act, "Information and Communication Technology (ICT) Standards and Guidelines," available at http://www.access-board.gov/sec508/refresh/draft-rule.pdf.

Contemporary experience - particularly in the field of information and communication technologies - suggests accessibility increasingly is recognized as a key element in product design and development. Internet search was cited as an example of a global public good, albeit one produced in response to market forces. In this case public resources supported early research and development of Internet technologies. The private sector, notably Google Corporation and Microsoft Corporation, among others, invested – and continue to invest – in Internet search technologies, characterized by lean and usable user interfaces.

In addition the British Broadcasting Corporation (BBC) has developed the "MyDisplay" tool,[207] which allows users to organize their user interface to BBC's online resources in ways that best meet their interests, needs and preferences. End-user preferences are stored as a theme in a BBC iD account (open to all) so users can chose their theme on smartphones, tablets and personal computers at anytime and anywhere. MyDisplay had a trial-test period of 20 December 2010 to 16 September 2011, with results being studied by BBC specialists concerning interface customization for people with vision and cognitive disabilities. The MyDisplay trial version had pre-set themes that BBC research had found would help people access and use its Web-based recourses: (1) people who have difficulty with reading or are dyslexic, (2) people who have limited vision, (3) people who have ADHD (Attention deficit hyperactivity disorder) or (4) people who have Asperser's syndrome.

Cloud-based technologies provide new and innovative opportunities for private, public and non-profit sector cooperation in developing and deploying of a range of assistive technologies with the sole requirement that end users have a reliable (and affordable) Internet connection.

- The Swiss-based Lucy Technology, Incorporated is undertaking the *LUCY Digital Inclusion* project,[208] a public-private initiative, with the aim of providing countries with a Cloud-based approach to deploying localized e-Services and e-Content without investing in infrastructure costs through a scalable digital inclusion platform. LUCY directs special attention to end users with special needs, including persons with disabilities, by ensuring software applications, services and content are fully accessible, consider local environments, meet relevant international standards and comply with universal design principles. LUCY provides a built-in set of assistive tools and applications for use as a browser plug-in or in the LUCY Cloud; these are both open source and proprietary. Applications are provided as "Software as a Service" for ease of use in the LUCY Cloud.

- The Global Public Inclusive Infrastructure (GPII), a concept initially proposed by the TRACE Center at the University of Wisconsin - Madison (USA) <http//:trace.wisc.edu)> and joined by the Inclusive Design Research Centre at OCAD University, Toronto ON (Canada) <http://idrc.ocad.ca>, has the aim of providing instant and automatic personalization of any device a person encounters to match their individual needs and abilities anywhere and at anytime.[209] GPII now has a

[207] MyDisplay Trial and resource pages, available at http://open.live.bbc.co.uk/atk/start?atk_url=http://www.bbc.co.uk/accessibility/mydisplay/. Since the MyService trial ended in mid-September 2011, the page has not been updated recently. The MyDisplay service is available as at August 2012, albeit with some know technical issues under review and development according to BBC.
[208] <http://www.lucytech.com/4801.html> .
[209] Gregg Vanderheiden and Jutta Treviranus, "Creating a Global Public Inclusive Infrastructure," *Lecture Notes in Computer Science*, vol. 6765 (2011). Constantine Stephanidis (ed). Universal Access in Human-Computer Interaction: Design for All and eInclusion; Proceedings, Part I, 6th International Conference, UAHCI 2011

headquarters at the Geneva-based Raising the Floor Foundation (RtF) <http://raisingthefloor.org/>, a consortium of academic, industry, and non-governmental organizations and individuals.

GPII does not envisage creating new access technologies or services, but involves systematic building of accessibility directly into the national broadband infrastructure. GPII is a software and service enhancement to broadband infrastructure designed to make development, delivery and use of assistive technologies easier, less expensive, and more effective. GPII design aims include: (1) allowing users to invoke and use access features they need anywhere, anytime, on any device; (2) providing users with simple and flexible ways ("wizards") to determine which access solutions work best for them; (3) lowering the cost of developing new types of assistive technology and new built-in "extended usability" features by (a) providing rich development tools, (b) providing a framework that allows developers, researchers, and consumers to work together to create solutions with less duplication of effort and (c) providing common core modules and services that can be used to build both commercial assistive technologies and built-in access features; (4) increasing the number and variety of developers and invigorate the field by (a) lowering entry costs for new assistive technology developers and (b) providing a low cost mechanism for moving new ideas from research to the market; (5) improving interoperability between mainstream and assistive technologies; (6) providing a mechanism to create 'ubiquitous' accessibility to match evolving ubiquitous technologies; (7) lowering the cost to governments, businesses, employers, and others who need to provide access to all they serve.[210]

First implementation of GPII was demonstrated at the *Cloud Computing Forum and Workshop V* (National Institute of Standards and Technology, Washington DC, 5- 7 June 2012) and at a research coordination and planning workshop convened at the European Commission headquarters in Brussels on 7 June 2012.[211]

This set of experiences demonstrates the role that public, private and academic partnerships can play in production and provision of accessible goods and services as global public goods. The review also begs a question of the role of policies, institutional arrangements, and choice of production technology in design, production, provision and maintenance of any global public good. This is an important consideration: decisions on design and provision of stock global public goods affect well being and levels of living for a long time. In an analysis of voluntary provision of global public goods, Professor Jack Hirshleifer examined how policy and production technology decisions result in different outcomes.[212] The analysis focused on three production technology decisions: (1) additive, (2) best-shot and (3) weakest link.

(Orlando, FL, 9-14 July 2011), pp. 516-527; see also Jutta Treviranus, "The Word "Cloud" Is Taking On a Whole New Meaning," (n.d.) available at http://www.abilities.ca/technology/2010/12/08/inclusive_design_institute/; and Gregg Vanderheiden et al, "Creating a global public inclusive infrastructure (CLOUD4ALL & GPII)," (n.d.) available at http://raisingthefloor.org/sites/default/files/2011%20AEGIS-Creating%20a%20Global%20Public%20Inclusive%20Infrastructure-Final.doc.

[210] "About GPII," available at http://gpii.net/About.html.

[211] "Barrier-Free Technology Coming of Age," (7 June 2012) available at http://trace.wisc.edu/news/archives/000280.php.

[212] See Jack Hirshleifer, "From Weakest-Link to Best-Shot: The voluntary provision of public goods," *Public Choice*, vol. 41 (January, 1983) pp. 371-386; cited in William D. Nordhaus, "Paul Samuelson …, op. cit.

1. Additive technologies. Professor Hirshleifer termed this the "conventional case" to produce a public good. This production technology choice is based on the analysis of public investment decisions on provision of collective goods by Professor Paul Samuelson: the public good is the sum of contributions of different producers.

Wikipedia, the online research resource, uses this production technology. Development and maintenance of content are the sum of volunteer contributor efforts. *Wikipedia* notes its production technology "enables instant and continuous quality control, by allowing anyone and everyone to participate in improving articles and the encyclopedia."[213]

Additive production technologies are based on policies that assume cooperative efforts by all - or most all – participants. A common criticism of additive production technologies is the free rider syndrome or a tendency for some to make episodic or minimum efforts to maintain or enhance a collective good or service in the absence of an appropriate governance framework.

2. Best-shot technologies. This production technology is based on significant contributions of effort by a single - or select few – individual(s), enterprise(s) or organization(s). The option assumes production of a designated public good will concentrate at the most efficient or low-cost producers.

While a best-shot approach may produce the best outcome in the case of a global public good that involves specialized and complex technologies, for instance development and deployment of satellite-based navigation systems,[214] the approach has been criticized due to an observed tendency that the low-cost and technologically-advanced provider often becomes the sole or dominant service provider.

Internet search was cited as an example of contemporary development and maintenance of a global public good. Competition in Internet search market share between the Google Corporation and Microsoft Corporation reflects ways in which technological advances can result in a dominant market position.

Decisions on the best-shot option need to include an appropriate governance framework to ensure not only that marginal costs of production equal social marginal benefits over the long term but that public service standards are appropriate, relevant and provide accessibility to a wide range of end-user needs in countries.

3 Weakest-link technologies. This production technology choice is based on an assumption of cooperation and collaboration among voluntary contributors – unlike the sole or limited cooperation often seen in best-shot approaches. The approach realizes that not all contributors will be able to make a maximum effort to produce and provide a designated public good or service – as in the case of the best-shot option. Outcomes result from differential inputs of voluntary contributors and reflect their respective capacities and skills they bring to the task. Hence, use of the

[213] Wikipedia: Quality control, available at http://en.wikipedia.org/wiki/Wikipedia:Quality_control.

[214] Global Positioning System (GPS), the satellite-based navigation system, was developed and deployed by the United States and became operational in 1994; it became a dual-use system (civilian and military) in 1996. Other countries are providing or developing similar capacities, which include: the Russian Federation's Global Navigation Satellite System (GLONAS), which was deployed in 1995; the Galileo satellite navigation system, which is under development by the European Union and European Space Agency; the BeiDou (Compass) Navigation Satellite System of China, which became operational in 2011.

term "weakest link" to indicate that outcomes depend on efforts of the most limited or least-capable contributors. Use of the term does not suggest that products resulting from weakest-link technologies are inferior to outcomes of the other two production technological choices. The term refers to the diverse nature of inputs involved in design production and provision, and maintenance processes.

Efficient and sustainable provision and maintenance of weakest-link public goods requires a framework to ensure ongoing consultation, cooperation and contributions of effort, consistent with individual voluntary production capacities.

Participatory problem solving - crowdsourcing[215] – reflects a number of weakest-link production technology characteristics. Normally, an interested party - a crowdsourcer, which may be an individual, institution, enterprise, will broadcast – electronically or by other means - a request for ideas and assistance to address a problem or to deal with a task: examples, cited in an earlier section, include real-time closed captioning for the deaf, development and provision of software to support text entry for those unable to use conventional keyboards,[216] and indexing the *Oxford English Dictionary*.

Crowd-sourced inputs vary due to the range of skills and knowledge available in the "crowd" of volunteers. The challenge for the crowdsourcer is apply critically these efforts to the task at hand. Quality assurance is the responsibility of the crowdsourcer, although social media and micro-blogs play increasingly important roles in quality assurance, in further development and in maintenance of a crowd-sourced products or services. Social media tend, moreover, to discourage free riders.

The weakest-link approach also is evident in the BarCamp international network of self-organized, user-generated conferences with open, participatory workshop-events where content is provided by participants.

The BarCamp Wiki <http://barcamp.org/BarCamp> describes the BarCamp format "as an ad-hoc unconference [user-generated conference] born from the desire for people to share and learn in an open environment... Anyone with something to contribute or with the desire to learn is welcome…."[217]

The BarCamp format, often associated with open-source technologies, increasingly is being applied in a range of mainstream settings. For instance the British Broadcasting Corporation (BBC) organized its first BarCamp at the BBC North Media City UK, on 17-18 September 2011, to find "new ways of working and…become a more open and collaborative organisation."[218]

C. Capacity-building, and engaging and empowering end users

Participants at the 2012 United Nations expert meeting noted a knowledge gap concerning accessibility in the field of information and communication technologies and the perception

[215] Jeff Howe, "The rise of crowdsourcing…," op. cit.
[216] The "Dasher Project," supported in part by the European Commission under its AEGIS project <http://www.aegis-project.eu/>, op. cit.
[217] "BarCamp: What is this all about?" available at http://barcamp.org/w/page/405173/TheRulesOfBarCamp.
[218] "BarCamp? What's a BarCamp?" available at http://www.bbc.co.uk/blogs/aboutthebbc/2011/09/barcamp-whats-a-barcamp.shtml.

among some designers and developers that accessibility concerns slow technical advances. Similar skill development concerns and experience gaps are presented in a recent study by the European Commission, "Accessibility in built environment,"[219] discussed in an earlier section

Despite a growing body of knowledge, technical resources and relevant experience on environmental accessibility, the challenge in skill development and provision of technical guidance on standards and performance requirements is maintaining currency and relevance in the light of the pace of change in mainstream development in all sectors. There are few easy solutions until accessibility is recognized as a core element is development decision making and not a issue of regulatory compliance issue.

Relevance and currency of skill development and technical guidance is particularly difficult in the field of information and communications technologies, where change is not only rapid but unpredictable. One factor noted by participants at the 2012 United Nations expert meeting on accessible information and communications technologies is the importance of quick and reliable access to the vast and dynamic global body of technical standards and functional requirements for accessible and usable information products and services, which should be presented without reference to a particular platform, device category or service. International cooperation had an important role to play in this regard, particularly as this pertained to stimulating exchanges, promoting participatory and democratic networks and ensuring access to un-served and under-served user communities. One example cited by experts involves the changing field of dynamic Web content, where video should be accompanied by text alternatives, and rich graphical interfaces, should offer low-density options to accommodate diverse end user needs and capacities to access, use and manipulate such content.

A current good practice resource for guidance documents cited by participants in the 2012 United Nations expert meeting is the Web Accessibility Initiative, which has produced a considerable and continuously revised and updated body of technical guidance on factors that affect Web accessibility and usability, which include Web authoring tools, rich content, and user agents (browsers and media players).[220]

A number of governments have addressed the skill gap by producing "toolkits" to guide developers of public Internet resources in accessibility concepts and practices. For instance, the Treasury Board Secretariat of Canada supported development and deployment of the *Web Experience Toolkit (WET)*, which includes reusable components to build and maintain Web sites that are accessible, usable, and interoperable. Reusable components are open source software and free for use by [Canadian] departments and external Web communities.[221]

At the international level, the International Telecommunications Union, Telecommunication Development Bureau (BDT joined the non-profit Global Alliance for Inclusive ICTs (G3ict) to produce and publish an "e-Accessibility Policy Toolkit for Persons with Disabilities."[222] The Toolkit introduction notes that the Convention on the Rights of Persons with Disabilities

[219] CEN/BT/WG 207. draft joint report (2011-08-03), op. cit.
[220] *WAI Guidelines and Techniques* resource page available at http://www.w3.org/WAI/guid-tech.html.
[221] *WET* is now supported by a third-party code management service, GitHub, which enables collaboration on Web projects internationally and with Canadian provinces and municipalities. The *WET* repository is available at https://github.com/wet-boew/wet-boew ; and *WET* working examples are available at http://wet-boew.github.com/wet-boew/demos/index-eng.html.
[222] Available at http://www.e-accessibilitytoolkit.org//.

provides that accessibility to information and communication technologies is a cross-cutting concern for a range of government agencies and ministries.

Social media have been playing an increasingly important role in promoting accessibility issues on the Internet and providing a sense of empowerment to a wide range of end users. The ability to provide real-time comment, perform quick and easy exchanges of resources as well as a sense of "community," often missing in discussion boards on conventional media, are contributing to expanded networks – real, virtual and increasingly mobile first – that support multi-channeled communications on accessibility issues and trends. One challenge: some social media resources do not provide fully accessible online resources.

Access to essential accessibility infrastructure, assistive technologies and augmentative devices in particular remains a challenge in realizing the development potential of the global Internet for all. Accessibility infrastructure was a priority topic for the 2012 United Nations expert meeting. Participants noted that many assistive and augmentative technologies are software-based rather specialized hardware. Since many of these software products are proprietary, a challenge for end users is meeting the cost of the software license.

Some meeting participants – and informed observers in the assistive technologies field – have discussed the role of open-source approaches in addressing a range of assistive and augmentative technology needs to provide expanded choice for users in countries. Open-source solutions are not second-best. Many developers prefer opportunities open-source development provide in terms of quick and rapid access to a body of technical knowledge and diverse expertise, which often is in contrast to the limited opportunities for collaboration in development and maintenance of proprietary assistive software. For instance, Canada produced its *Web Experience Toolkit* as an open-source product. NV Access, an Australian-based non-profit organisation, developed *NonVisual Desktop Access* (NVDA) as free, open-source software for screen readers running under the Microsoft Windows operating system. NVDA provides user feedback via synthetic speech and Braille.[223]

While there is a growing body of knowledge and expertise concerning environmental accessibility to support a range of capacity building efforts, there is somewhat less evidence of public recognition of the accessible and usable design and its contribution to sustainable and inclusive development for all. Discussion of creative and effective use of first principles of accessible and usable design solutions generally occur in publications addressed to building and design professionals, academics and organizations concerned with advancement of persons with disabilities as well as governmental bodies, which often are sponsors of accessibility and usability efforts. This tends to reinforce perceptions that accessible and usable design is a compliance issue, a topic concerned mainly with targeted populations and not a mainstream resource that contributes to improved levels of living and well-being of all. The challenge, now, is fundamental change in development discourse to reinforce the disability dimension in mainstream development strategies, policies and programmes.

V. Concluding remark: reconsidering accessibility in the development mainstream

The review discussed the body of normative guidance on accessibility as a basic right and as a key factor in furthering the goals of full participation and equality of persons with disability

[223] NVDA currently supports over 35 languages; see http://www.nvda-project.org/.

in mainstream development, and noted the link between these principles and international development strategies remains elusive to date. It argued that accessibility in the context of development should be viewed as a global public good rather than a cost of complying with non-discrimination policies and legislation. This suggests three areas for changes in the mental environment for mainstream development analysis, planning and evaluation.

- Need for a vision. Accessibility as a mainstream development topic will require a new vision of international development in the twenty-first century, which is suggested by priorities being discussed for the post-2015 period: sustainable, equitable and inclusive development. Poverty and chronic hunger remain important concerns, and their eradication will require efforts by the many on the basis of full participation and equality – women and men alike.

- Role of people and processes. A development vision that incorporates accessibility to the general systems of society as specific policy and programmatic concerns will require a considerable effort to align development constituencies to more inclusive and participatory processes of development. Outreach and training in environmental accessibility in the context of development have essential contributions to make. These should no longer be a topic of concern for targeted populations but be addressed to a broad spectrum of development agents, representing public, private and civil society participants, whose skills, experiences, initiative and industry will be critical in building awareness and undertaking practical efforts to further a process of sustainable, equitable and inclusive development for all.

- Role of tools: skills, knowledge and techniques. Environmental accessibility in the context of mainstream development will require new tools of analysis, planning and programming of resources, monitoring and evaluation with a view to shift the debate from the costs of accessibility to its role as an investment in sustainable development and its contribution to production and distribution-related value chains.

Mainstreaming accessibility concerns was a recurring topic at the 2012 United Nations expert meeting. Participants identified several 'key principles" for accessible and disability-inclusive designs in the context of disasters and emergency situations, since these affect everyone and involve mainstream rather than targeted interventions to be effective. Three of these principles are equally relevant to analysis, planning and provision of accessible and usable products and services – public and private – in mainstream development settings as well:

1. Fundamental integration**.** Focus on integration and coordination of persons with access and functional needs into every aspect of risk reduction, emergency preparedness and disaster response and recovery.
2. Whole community approach**.** "Whole Community" approaches engage individuals and communities and make strategic use of accessible ICTs in all [emergency services] delivery mechanisms.
3. Nothing about us, without us**.** Persons with disabilities and others with access, functional needs or both must be involved, empowered and fully engaged in the whole spectrum of disaster and emergency-related activities. This will contribute to changes in attitude and reduce stigma: persons with disabilities are recognized as resources and not members of a targeted population

Remarks on empowerment and capacity building suggest the challenge is not more regulation or added enforcement but a need to inform and engage society as a whole of the way in which accessibility in the general systems of society benefits all and is essential for sustainable, equitable and inclusive development and poverty eradication.

Strategic guidance should address compliance with accessibility standards as a factor that adds value to goods and services by its potential to expand the population of end users rather than a cost that detracts from bottom lines and slows innovation. Tactical considerations should focus on promotion of awareness and support for environmental accessibility and on dialogue concerning the role of accessible and usable products and services in everyday life.