

The Information Society and Its Relationship to Achieving Sustainable Development

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Abstract

The scientific and cognitive transformations of the second half of the twentieth century made knowledge a defining feature of contemporary civilization. Knowledge increasingly emerges from the interaction of advanced technology, developed human capabilities, intellectual capital, and the knowledge economy. This convergence has produced the information—or knowledge—society, in which the generation, dissemination, and application of knowledge shape economic and social progress. At the same time, technological expansion and consumption have intensified global environmental pressures and raised questions about humanity's long-term survival. Sustainable development therefore offers an integrated framework for meeting present needs while protecting the capacity of future generations. This paper examines the concept, principles, dimensions, and indicators of sustainable development; the role of the internet and virtual media; and the relationship between the information society and sustainability. It argues that qualified human capital, effective information governance, digital access, critical and creative thinking, research, innovation, and enabling institutions are essential for turning knowledge into equitable, environmentally responsible, and durable development.

Keywords: information society; sustainable development; knowledge economy; information and communication technology; internet; knowledge management; human capital

Introduction

Contemporary societies increasingly operate through knowledge. Globalization has become a powerful ideological and structural force, while advanced scientific and technological capabilities have visibly influenced economic and social development and increased the knowledge-based share of gross domestic product. The extent to which information and communication technologies are used has consequently become central to the transition toward an information society.

Sustainable development emerged in response to environmental realities that modern ways of living could no longer ignore. Scientific and technological progress improved welfare and expanded many dimensions of life, but it also accelerated excessive consumption and generated risks that threaten humanity's future. Because societies cannot simply abandon the benefits of progress, sustainable development has evolved from an environmental imperative into a comprehensive human project.

Defining Sustainable Development

Although the idea of sustaining human life and resources is ancient, “sustainable development” is a comparatively recent term. It gained international prominence at the 1972 United Nations Conference on the Human Environment in Stockholm, where sustainability became a framework connecting environmental protection with economic development, poverty reduction, and equality.

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The expression has many translations and interpretations, including durable, maintainable, continuing, or sustainable development. The Arabic manuscript adopts the equivalent of “sustainable” because it combines linguistic suitability with the intended meaning of continuity.

The most widely cited definition appeared in the 1987 report of the World Commission on Environment and Development, commonly known as the Brundtland Report: development that meets the needs of the present without compromising the ability of future generations to meet their own needs (World Commission on Environment and Development [WCED], 1987). The definition stresses continuity in the productivity of natural resources and intergenerational responsibility.

Economist Robert Solow framed sustainability as preserving the productive capacity available to future generations and leaving it in a condition comparable to that inherited by the current generation. From this perspective, sustainability becomes a question of saving, investment, and the balance between present and future resource consumption.

The World Commission’s report, *Our Common Future*, argued that humanity needs a new development path capable of sustaining progress not merely in a few places or for a few years, but across the entire planet and far into the future. The World Bank similarly links sustainable development to continuous intergenerational equity and to maintaining or increasing comprehensive capital over time, including industrial, human, social, and environmental capital (World Bank, 2003).

Herman Daly’s approach emphasizes maintaining qualitative development over the long term while constraining economic growth by ecological and socioeconomic limits. Environmental systems must continue to perform two central functions: replenishing economic and ecological resources and absorbing waste generated by human activity.

At the 1992 United Nations Conference on Environment and Development in Rio de Janeiro, Principle 3 affirmed that development should equitably meet the developmental and environmental needs of present and future generations. Principle 4 established that environmental protection must form an integral part of development and cannot be considered in isolation.

In summary, sustainable development meets present needs while preserving the ability of future generations to meet theirs. It promotes economic continuity while respecting nature, conserving resources, and protecting the right of future generations to development.

Principles of Sustainable Development

The relationship between economic growth and the environment helped shape the following principles:

- Use systems thinking when preparing and implementing sustainable-development plans.
- Enable effective participation by public authorities, civil society, and communities in planning, implementation, and monitoring.
- Optimize the dynamic use of economic resources through rational, evidence-based consumption programs.
- Extend the useful life of resources through strategic planning, science, and technology.
- Maintain ecological balance and biodiversity while avoiding negative environmental impacts.
- Reconcile the needs of present and future generations through fair intergenerational distribution of wealth and opportunity.
- Preserve the defining characteristics of nature when designing production, investment, and consumption structures.
- Promote viability, resilience, competitiveness, and continuous improvement in quality of life.

Across the literature, these principles are often consolidated into four themes: integrating environmental and economic considerations in decision-making; broad social participation; environmental prevention and safety; and intragenerational and intergenerational justice supported by continuous improvement.

Dimensions of Sustainable Development

The Brundtland Report opened with the observation that “the Earth is one, but the world is not,” highlighting the global unity of environmental systems alongside economic, social, and political diversity. Sustainable development serves humanity in the present and the future through three interconnected dimensions.

Economic dimension

Economic development has long sought to satisfy basic needs by expanding production; correct imbalances in income distribution; improve product quality and living standards; develop human resources; reduce unemployment; and strengthen the industrial sector through appropriate market mechanisms.

The contemporary economic perspective has expanded toward ecological economics and the concept of natural capital. Plants, soil, animals, fisheries, and ecosystem services—such as air purification and water filtration—are foundations of economic life. Sustainable development therefore seeks consistency between current and future economic activity, environmental consequences, and human use. It favors clean technology, scientific knowledge, and values that prioritize durability and continuity while protecting long-term ecological balances.

Environmental dimension

The environmental dimension protects nature from depletion and degradation for present and future generations. It requires appropriate legislation, energy governance, environmental education, and rational use of nonrenewable resources. The “environmental limits” approach recognizes that every natural ecosystem has boundaries that cannot be exceeded without damage.

- Maintain ecological balance and preserve biological diversity.
- Use the physical environment without pollution and prioritize clean technologies.
- Promote awareness of cultural, social, urban, and natural environments.
- Protect ecosystems from pollution, depletion, and destructive exploitation.

Social dimension

Human beings are both the center and the ultimate purpose of development. The social dimension emphasizes social justice, poverty reduction, equitable resource distribution, access to essential services, public participation in decisions, and access to information that affects daily life. Growth should strengthen social cohesion and support political choices based on fairness among generations and among countries.

Social sustainability also protects community values, traditions, institutions, and cultures; integrates marginalized groups; and respects human rights, including the right to a healthy environment, adequate nutrition, education, and respect for local cultures. Poorly managed development may damage traditional production systems and social structures, destroy cultural and archaeological sites, encourage harmful materialism, disrupt demographic patterns, spread violence, and deepen dependence on external aid and debt.

Indicators of Sustainable Development

Indicators are essential tools for measuring sustainable development. International organizations, led by the United Nations, have promoted indicators to provide clear foundations for action at different levels, support environmental and developmental continuity, guide decisions, and evaluate strategies. The United Nations Commission on Sustainable Development developed a reference framework of approximately 130 indicators grouped into social, environmental, economic, and institutional categories.

Agenda 21 established comprehensive strategies for confronting major twenty-first-century challenges and affirmed the close relationship between environment and development. The World Summit on Sustainable Development later adopted the Johannesburg Plan of Implementation to accelerate action through international and regional cooperation and to change unsustainable production and consumption patterns.

Environmental indicators

Land

Land sustains life through agriculture, vegetation, forests, oxygen generation, energy, and natural resources. Misuse contributes to fertility loss and desertification, while logging destroys forests that are vital to ecological balance. The manuscript reports an annual global forest loss of approximately 17 million hectares. Common indicators include agricultural conditions, forest cover, and desertification.

Freshwater

Water is indispensable to life and development. Indicators assess water quality and quantity, while policy seeks to prevent pollution, waste, and unsustainable consumption.

Seas, oceans, and coastal zones

Coasts and marine ecosystems require protection from pollution and overfishing. Indicators include the condition of coastal areas and the quantity and sustainability of fish production.

Biodiversity

Biodiversity indicators include the proportion of threatened species and the area of protected zones. Their purpose is to preserve living systems and prevent overexploitation.

Atmosphere and climate

Atmospheric indicators address climate change, ozone depletion, air quality, pollutant concentrations, and consumption of ozone-depleting substances. Governance frameworks include the Vienna Convention, the Montreal Protocol, the United Nations Framework Convention on Climate Change, and the Kyoto Protocol. Industrialized economies have historically produced a major share of toxic and nuclear waste from heavy industry.

Economic indicators

Economic structure

Economic indicators measure growth, distribution of wealth, trade, and the effects of policy on natural-resource investment. Typical measures include gross national product growth, per-capita income, exports and imports, debt, foreign aid, and their relationship to national output.

Consumption and production patterns

Sustainable policy rationalizes production and consumption, addresses inequalities between the Global North and South, and combats poverty. Indicators include raw-material intensity, per-capita energy consumption, industrial and household waste, recycling, and annual transport use.

Output and investment

Gross domestic product per capita is a major measure of economic activity but does not fully capture sustainability or quality of life. Gross investment as a percentage of GDP measures expenditure on additions to fixed assets relative to total production.

Social indicators

Social equality

Equality involves fair distribution of resources and equal access to health, education, and employment for current and future generations. Agenda 21 also addresses poverty, consumption, production, women, children, and youth.

Housing and health

Decent housing requires effective urban planning capable of meeting rising demand. Public health is closely linked to sustainability: health and environmental services can determine the success of development plans. Priorities include disease control, adequate food, safe drinking water, and protection against malnutrition and epidemics.

Education, population, and security

Education is a core sustainability indicator because it is connected to social and economic progress. Priorities include universal primary education, gender equality, alignment with development needs, and expanded training and public awareness. Population growth can intensify poverty, environmental decline, and social pressure, while security is a prerequisite for development and human-rights protection.

Institutional and digital indicators

- Main telephone lines per 100 people, reflecting telecommunications infrastructure.
- Mobile subscribers per 100 people, reflecting access to public mobile networks.

- Personal computers per 100 people, indicating capacity to participate in the global economy and enhance productivity.
- Internet users per 100 people, indicating participation in the information age and supporting comparison and evaluation of development institutions.

The Role of the Internet and Virtual Media in Sustainable Development

Expanding and improving internet access helps reduce digital illiteracy. Integrating internet technology into education and training is an indicator of transition toward an information society—one that generates, disseminates, and applies knowledge efficiently across the economy, civil society, politics, and private life. Computers, software, and internet access can increase the speed and ease with which learners obtain educational content without temporal or geographic barriers (Saadah & Al-Sartawi, 2003).

The internet is a principal infrastructure for disseminating knowledge and accessing information resources. Digital networks make stored knowledge easier to retrieve and distribute. Access should therefore be extended across official and nonofficial institutions and incorporated in ways that enrich sustainability knowledge and allow it to circulate widely.

Scientific and research institutions rapidly adopted the internet to access knowledge, exchange expertise, develop information and communication technologies, create software and digital content, and connect vital sectors with global knowledge sources. These capabilities can be invested in environmental, social, and economic sustainability projects.

Societies increasingly use knowledge to manage public affairs and prepare for participation in a knowledge economy. Contemporary technological change has enabled greater integration among knowledge production, renewed dissemination, and communication among individuals and institutions through digital networks.

The Information Society and Sustainable Development

Advanced countries and countries aspiring to progress continuously strengthen the foundations of the knowledge society to benefit from its human, social, economic, and political potential. These foundations revolve around a knowledge cycle with three principal stages: generating knowledge through research, scientific creativity, and innovation; disseminating knowledge through education, training, and media; and applying knowledge to create services and products, employment, and new income sources that reinforce development and sustainability (UNESCO, 2005).

Generating knowledge

Knowledge societies must develop multiple forms of thinking, particularly critical and creative thinking. These capacities make it possible to question previous assumptions, generate new knowledge, replace harmful practices with useful alternatives, and take rational action. They also help people become more creative, balanced, and adaptable to economic, social, political, and cultural change.

Knowledge generation requires enabling environments: broader public freedoms, laws that support knowledge institutions, and development plans aligned with the requirements of a knowledge society. Investment in human capabilities and research is central to these environments.

Disseminating knowledge

Knowledge dissemination can strengthen sustainability because networked societies are better positioned to understand global problems. Environmental threats, technological risks, and economic crises can be addressed more effectively through international cooperation and scientific participation. Broad access to research, studies, and reliable information supports informed decisions based on balanced assessment.

Dissemination should be followed by contextualization and localization. Imported knowledge should not remain a copied body of information detached from its new environment. Openness, communication, research centers, international knowledge networks, training, and professional development are essential to cultivating the capacity to develop knowledge locally.

Applying knowledge

Knowledge application completes the knowledge life cycle by converting knowledge into social and economic value. A society's capacity to produce, adapt, and apply knowledge is crucial to sustained economic growth and higher living standards. Progress in agriculture, health, and environmental protection increasingly depends on education, innovation, and the productive use of new technologies.

Application is inseparable from production and dissemination. Societies should not wait until knowledge is fully localized before using it; purposeful application itself contributes to localization and new knowledge production. Application must go beyond the mechanical transfer of tools. It involves innovating and reproducing methods capable of transforming society, the economy, and knowledge so that human needs are met without undermining future development.

Conclusion

The components of knowledge are interconnected and mutually reinforcing. Enabling environments, knowledge production, dissemination, and application together form the information society and position people as active agents who influence and are influenced by intellectual and scientific creativity. Effective development and use of human capabilities are therefore fundamental to sustainable development.

Building a knowledge society is a powerful mechanism for achieving sustainability. Weak performance in producing, disseminating, or applying knowledge delays integration into the information society and reduces the capacity to design mechanisms that advance sustainable development. Countries must consequently develop rigorous strategies that address barriers to knowledge-society participation and explain why knowledge does not yet perform its full developmental role in some contexts.

An effective strategy should combine universal digital access, strong education and research systems, critical and creative thinking, reliable sustainability indicators, environmentally responsible innovation, knowledge localization, inclusive institutions, and meaningful public participation. The central policy challenge is not simply to accumulate information, but to govern and apply knowledge in ways that are equitable, ecologically sound, and capable of sustaining human well-being over time.

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