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IAP Statement on Urban Development 1996

THE CHALLENGES OF AN URBAN WORLD

During the next century more than half of the world's inhabitants will reside in cities. The rapid growth and urbanization of the world's population are the result of many complex economic, social, demographic, and political factors and pose unprecedented challenges to the functioning of human settlements and the quality of life for their inhabitants.

Urbanization has many beneficial aspects. Cities play an increasingly vital role in education, culture, and productivity. The process of urbanization is also a significant factor in the worldwide demographic transition to lower birth rates.

Cities throughout the world, however, suffer from a host of problems, including congestion, pollution of air and water, inadequate water supplies, wasteful use of energy, problems of waste disposal, inadequate housing, the spread of communicable diseases, and the deterioration of social support systems. Many cities have expanded into areas prone to earthquakes, floods, and other natural disasters. Even those cities which are no longer growing in population continue to expand in territory, dwelling space, transportation density, resource consumption, and production of wastes.

The problems of our cities must be addressed by effective economic and social policies and strategies. Science and technology also have a crucial role and responsibility in providing solutions and in ensuring the long-term sustainability of cities and the ecosystems on which they depend. A critical factor in the ability of science to contribute to solutions will be the education, training, and capacity building of local scientific and technical expertise.

POTENTIAL OF SCIENCE AND TECHNOLOGY FOR URBAN DEVELOPMENT AND SUSTAINABILITY

Advances in science and technology - especially progress in transportation, communication systems, public health, and agricultural and industrial production - have significantly contributed to the evolution of cities. In recent decades, many important new discoveries have been made in essentially all aspects of the sciences and engineering. While this wealth of new knowledge has improved the quality of life for millions of individuals, many new technological advances have only slowly penetrated to the less affluent communities of the world. In general, the potential for science and technology to ameliorate or solve the problems of the world's multiplying cities has not been realized. A much broader discussion is needed on how the range of existing technological and scientific

research findings can be translated into actions at the national, regional and local levels.

As urban populations multiply, older technologies and practices - previously appropriate to settlement development - will not necessarily be the best solutions to these problems. Indeed, some once-successful technologies can lead to difficulties and become problems as the process of urbanization continues. Urban planning for the next century thus requires a fresh consideration of the current problems and available solutions within the context of regional environmental, cultural, and socioeconomic conditions.

Many new discoveries in science and engineering are potentially applicable to the amelioration of urban problems. Among these are the following:

Computational Capability. The rapid expansion of computational power over the past two decades has permitted the construction of intricately detailed models of the behavior of the Earth's atmosphere on both global and regional scales. These models have improved steadily in recent decades and are now in worldwide use, proving better and more sophisticated understanding of the world's climate system. Comparable computational ability for modeling the micro-climatic behavior of individual buildings and building complexes also exists, but has only rarely been applied despite its obvious utility for reducing energy consumption and improving indoor air quality and the health of the inhabitants.

Waste Disposal and Recycling. Tremendous advances have been made in waste disposal and recycling, especially of building materials and other solid waste, but are still slow in penetrating into general use globally. However, a cohesive overall plan for sustainable waste management is possible for most cities in the world. Such a plan would include techniques which ensure waste avoidance, re-use and recycling, reduction of toxic waste, proper use of incineration and landfills, and innovative biological waste management processes. The aim of such planning should be to reduce the environmentally damaging effects of the growing quantities of waste.

Global Positioning Systems and Global Information Systems. The advances in global positioning systems (GPS) now permit entirely new methods of land management, especially when coordinated

with hand-held communication systems. These are in turn part of the rapidly expanding capability of global information systems (GIS) for storage and manipulation of vast quantities of demographic, geographic and other data. These same data manipulation capabilities underlie the important development of computer-assisted and ultimately computer-controlled transport systems.

Biotechnology and Ecological Engineering. The developments of biotechnology and ecological engineering promise changes in the design and physical structure of the human ecosystem, which will allow use of local resources in a more sustainable manner. For example, parks may serve as lungs to process vehicle emissions, and buffer zones of wetlands can prevent deterioration in coastal zones because of waste and pollutant release.

Disease Surveillance and Control. In recent decades, improvements in sanitation and implementation of effective intervention programs have reduced mortality from infectious diseases in most of the world's population. However, increased urbanization--in combination with poverty, pollution, poor sanitation, and inadequate health services--has contributed to a resurgence of infectious diseases, many of which are becoming increasingly drug resistant. The challenge for public health is remediation of the conditions that are fostering this increase. Examples of possible interventions include establishment of coordinated global systems of disease surveillance and control using modern scientific methods and technologies, and accelerated development of promising new drugs or vaccines.

DEVELOPING AN URBAN RESEARCH AGENDA

While much research is being conducted relevant to the challenges of cities and other human settlements, neither the pace of scientific research nor its transfer into practical application has kept up with the rapidity of urban growth. This situation exists in both the developed and developing worlds.

The generation of new knowledge about how cities and their various components actually operate requires commitment to scientific study far beyond current levels. Research into all aspects of urban development, including the managerial and political approaches to transfer of new knowledge into

practice, needs to be intensified. Strengthening of research within developing countries is important for generating new knowledge relevant to the challenges of cities and for promoting collaboration with research institutions in more developed nations.

Important research areas with specific focus on urban settlements include (with no order of priority) the following:

- Integrated approaches to urban systems and their environments
 - New housing types, materials, and production methods, with an emphasis on housing for limited-income populations
 - Energy systems for densely populated settlements
 - Waste treatment, reuse and disposal
 - Disease surveillance and control and improved health care services
 - Environmental quality, with reference to water, soil, and air.
 - Economic diversification
 - Information and communication technologies, including geographical information systems
 - Improved public and private transportation
 - Monitoring, maintenance and evolution of physical infrastructure, including improved prediction and mitigation of natural disasters.
 - Human behavior and adaptability to urbanization-issues of urban crime and other social stresses
 - Changing demographic patterns, including redistribution of population and the role of urban areas.
 - Improving living quality in slum and deteriorated areas, informal neighborhoods, and squatter settlements.
 - Urban labor markets, community development, and absorption and integration of migrants
- journal content and, to the extent possible, data upon which research is based, be prepared and presented in a standard format for electronic distribution to facilitate ease of use;

LOCAL AND NATIONAL CAPACITY BUILDING FOR SUSTAINABLE CITIES

Each urban area constitutes a unique entity in terms of geography, climate, economic and cultural history, and form of governance. Thus site specific solutions to urban challenges should be sought at all stages of investigation, planning, implementation and management. Local expertise and knowledge derived

from worldwide research and experience are both required for successful resolution of the problems of each city or metropolitan region.

Planning and Leadership. The improvement of existing cities, as well as planning for future urban settlements, needs to become a new priority discipline in which expertise is developed locally and shared more broadly. Planning includes interaction among major elements of human settlement development, such as housing, transportation, water, waste management and health systems, energy, communications, and job locations. Each urban planning and economic development strategy must take account of complex interactions with the natural environment and with other human settlements, and must recognize the necessity of a functional ecological resource base for the long-term survival of the city. This is especially important in fragile ecosystems.

Political leaders and managerial and planning experts need to be in continuous communication with each other and with the scientific community. They should be broadly knowledgeable of relevant developments in a wide range of disciplines, including the physical sciences, engineering, agriculture, human health, ecology, economics, geography, architecture, sociology and the political sciences.

Education and Training. The foundation of all capacity for addressing the challenges of urban settlements - whether related to poverty, housing, energy, water supply, sanitation and health, employment, or other components - is the education and training of all segments of the population. Important elements include: universal basic literacy and education, founded on up-to-date scientific knowledge. It is especially important to include women and populations in the marginal or informal employment sectors continuing training to provide citizens with the ability to adapt to new employment opportunities, as well as to the changing nature of employment. These changes are associated with rapid shifts in the global economy and with the emergence of new technologies which alter not only products and production processes, but also living and working conditions.

Absorption and Generation of Knowledge. Higher education and research are necessary not only to produce new knowledge, but to build the capacity to

assess, absorb, and use technology and experience developed elsewhere. Research capability should be developed to address the sustainability issues inherent in the choices and plans of each locality and country. This includes the ability to assess indigenous and traditional knowledge, and to combine it as appropriate with knowledge obtained elsewhere.

Knowledge Centers and Linkages. The nature and complexity of challenges of urban settlements inherently require integrated efforts among education, research, and operational institutions. A barrier to the application of scientific and technological advances has been the sectoralization of education, industrial, public sector, and other science and technology institutions. It is critical to develop interdisciplinary mechanisms for linkages, communication, and cooperation among these sectors. This function can be performed by creating or enhancing integrated educational programs, knowledge centers (such as universities, technology parks, and research centers), and networking initiatives at the local, national, regional, and international levels.

Maintenance and Evolution of Infrastructure. Planning and education capabilities should include the ability to foresee, at the outset, the human and other investments needed to maintain the technological systems by which urban settlements function. The evolution, replacement, and modification of systems need to be integral elements of infrastructure concepts. The capability to plan for and mitigate natural and man-made disasters is a critical element in the functioning and survival capacity of urban settlements.

Providing the Environment for Successful Innovation. Several non-technological institutional elements are critical to enabling technological innovation and successful handling of challenges of urban settlements. These include: legal frameworks, including property ownership and the protection of intellectual property, effective and flexible standards, institutions for efficient mobilization of capital resources, tax and regulatory structures which are conducive to innovative solutions to urban challenges.

Monitoring, Assessing, and Evolving. Urban settlements are changing at an unprecedented

rate. There is thus an urgent need to measure continuously their status and to monitor changes in order to project future developments and identify appropriate policies. For example, the capacity of the environment to produce basic resources and to process urban wastes must be explicitly evaluated. An effective capability for measurement of parameters such as water quality, air quality, and demographic changes requires an operational organization and ongoing interaction among political leaders, urban planner, the public, and the research community. Scenario building and modeling are important tools to link monitoring, research, and planning.

INTERNATIONAL COOPERATION

Cities and other human settlements do not exist in isolation. Action taken locally by one city may generate regional and even global effects. Innovative solutions developed in one city may have application elsewhere. New forms of international cooperation are thus required for developing and sharing information and technologies for the benefit of all urban areas.

Multinational Research Planning. The sustainability of cities in the next century requires a better understanding of the complex interactions among environmental, economic, political, social and cultural factors at local, regional, and global levels. Multinational cooperation is required to assess scientific and technological priorities and to sponsor research efforts encompassing scientists and engineers throughout the world. The commitment of the scientific community to develop collaborative research programs in areas of common interest needs the support of governments and international agencies. While some of these activities can be performed within current budgetary allocations, additional resources will often be necessary.

Information Sharing. The scientific approaches and technological possibilities that find application in one urban location often are very useful in many areas of the world. New communication networks are required that link existing and newly created international and regional research and training centers. Current information and telecommunication networks can be utilized to facilitate new linkages among researchers and urban planners. The exchange of information and sharing of experiences among cities through the world can be enhanced by

new communications technologies.

Capacity Building. For international cooperation in science and technology to be effective in supporting sustainable development of urban settlements, the overall competence of all the participants needs to be heightened. Scientists and engineers in all the world's urban communities must be able to evaluate the local requirements, develop competence to solve local and national problems through appropriate R&D, evaluate, assimilate and adapt indigenous and emerging technologies, and effectively participate in regional and international research cooperation. Where necessary, international assistance should be provided for capacity building of local scientific and technological expertise.

CONCERTED ACTION

Science and technology can produce widespread benefit for future generations only if there is synergy among scientific research, urban planning, and management. The worldwide scientific community must work together and with political and managerial decision makers to identify and implement innovative solutions for meeting the needs of the world's 21st century cities.

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