

United Nations Environment Programme

、 联合国环境规划署 PROGRAMME DES NATIONS UNIES POUR L'ENVIRONNEMENT ・ PROGRAMA DE LAS NACIONES UNIDAS PARA EL MEDIO AMBIENTE ПРОГРАММА ОРГАНИЗАЦИИ ОБЪЕДИНЕННЫХ НАЦИЙ ПО ОКРУЖАЮЩЕЙ СРЕДЕ

Second World Urban Forum Dialogue on Urban Sustainability

Local Capacities for Global Agendas; Impact of Cities on the Global Environment

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Urbanisation is rapidly increasing world wide. At present, over half of the world's residents live in human settlements. This trend will continue especially in developing countries and will present major challenges to local and national governments. The environment and health impacts of the ever growing cities are enormous. Especially the poor are affected. The subject of this presentation is the role that cities play at the international environment; their contribution to and possible role in national, regional and international environmental issues. With more people living in cities and with an increasing number of mega-cities, the role of cities in issues such as climate change, transboundary water and air pollution and biodiversity becomes increasingly important.

Introduction

Urbanisation is one of the most significant processes in our society over the past century. The move from a mainly rural society to an urbanized world has impacted on all levels of our lives. In 1950 less than one third of the world's citizens were living in cities, but by 2025, this will be two-thirds, and 90 percent of them will be living in developing country cities. Of the three persons born each second in the world, two are born in cities. This shift from rural to urban has severe social, cultural, economic, and environmental impacts. However, where urbanization in the developed countries went hand in hand with economic growth and rapid increases in welfare, this is not the case with developing countries.

At present, the world's urban population is estimated at 3 billion, of which 2 billion are living in developing country cities. The growth of cities is caused by positive birth rates in the cities, migration from rural areas and expansion of urban areas. It is expected that the world's urban population will double in only 30 to 35 years from now, at which time four out of five urban residents will be living in developing country cities. This will increasingly be in so-called mega cities. In 1975 only five cities world-wide had 10 million or more inhabitants, but this number is set to increase to 23 by 2015. By then, Bombay, Dhaka, Lagos and São Paulo each will have over 20 million residents. In 1955, the majority of the world's largest cities were located in developed countries, in 2015, 25 out of the world's biggest 30 cities will be found in developing countries. Also, by 2015 an estimated 564 cities around the world will have 1 million or more residents; 425 of these will be in developing countries.

Cities are centres of production, education, and social and cultural activities. Although cities are taking up only 4 percent of the earth's land, they use huge amounts of natural resources, such as energy, water, minerals, and often the best lands. Where resources are flowing into the cities, wastes in solid, liquid and gaseous forms are emitted and "exported" by the cities. This has severe environmental impacts, first and foremost to the city residents, but increasingly also on the direct surrounding areas of the cities and the national, regional, and global levels.

However, cities also provide opportunities to improve the quality of life. In cities residents find medical services, access to information technology, learning institutes, financial services and other facilities. Cities also provide opportunities to address these issues, to improve the situation for the local residents and to reduce the contribution to regional and global environmental issues.

This presentation will not focus on the increasing and very serious effects of growing urbanisation on the urban residents themselves, but not because it does not occur. For example, it is estimated that over 1 billion people are forced to breath air that exceeds WHO standards (and more than one million die from it annually). And about 1.2 billion people have no access to safe drinking water and some 2.4 million children die every year due to water related diseases. This presentation will focus on the international dimension: the importance of cities in addressing environmental problems that originate in cities but exceed the boundaries of the cities themselves.

The Link between the Urban and Rural Environment

A city's environment and development cannot be seen isolated from its surroundings. Urban areas need an increasing supply of natural resources for their production and consumption needs, which are brought in from the rural areas surrounding the urban centers. The activities taking place in the cities

result in environmental pressure where resources are depleted and pollution is emitted. Some of this pollution stays within the city boundaries, but much of it affects the rural areas surrounding the cities. Cities, in their need for resources, can deplete natural resources, such as forests (wood for cooking, heating and building materials), foods, land (e.g., encroachment on agricultural land, or wetlands), produce waste (e.g, pollution of rivers, and dumping of solid wastes outside the city) and air pollution, and use other resources in the rural areas (e.g., urban residents recreating in the rural areas surrounding the city). As urbanization increases, these resources have to be brought in from further and further away from the cities, as the resources close by have been exhausted or polluted.

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Cities find that cooperation with the rural areas in protecting watersheds that are used to produce drinking water for the city is more efficient than increasing investments in water filtration. The city of New York has plans to buy USD 300 million worth of land upstate to protect the watersheds that are used for producing the city's drinking water. This is part of a watershed protection strategy that will cost USD 1.4 billion, but is estimated to save the city from having to spend USD 3-8 billion for new filtration systems to clean the increasingly polluted water. The city of Phoenix, USA, has found it cheaper to create wetlands around the city than to further invest in additional wastewater treatment facilities (which would cost USD 625 million).

However, cities are not only consuming what rural areas are producing, cities also add to urbanrural interdependence. For example, cities provide facilities, services and jobs, and have been the driving force behind rural development. It is therefore crucial to analyse the urban environment impacts of urbanisation in the context of interdependent urban-rural systems.

City Environmental Balance

Urban areas consume massive amounts of environmental goods and services imported from beyond their borders. For example an average European city of 1 million inhabitants imports daily: 11,500 tones of fossil fuels, 2,000 tones of fossil fuels and 320,000 tones of drinking water. It "exports" 25,000 tones of carbon dioxide into the air, 300,000 tones of waste water and 1,600 tones solid waste.

The London Trust co-founder, Herbert Girardet, has tried to estimate the ecological footprint of the city of London. London, with 12 percent of the UK population and covering 170,000 hectares, has a footprint of approximately 21 million hectares, or 125 times the surface area of the city itself. This is equivalent to all the productive land in the United Kingdom, so, obviously, London is relying on land outside the UK to be able to sustain itself at its present lifestyle. William Rees, Professor of Community and Regional Planning at the University of British Columbia, has made a footprint analysis of his home city of Vancouver, Canada. His study estimates that Vancouver appropriates the productive output of a land area nearly 174 times larger than its area to support its present lifestyle. Other studies show similar results. In a study of 29 cities in the Baltic Sea drainage basin researchers have found that the aggregate consumption of wood, paper, fibre and ore by the inhabitants appropriates an area 200 times larger than the cities themselves.

The UN Food and Agriculture Organisation (FAO) estimates that a city of about 10 million people in the developing world –Cairo or Rio de Janeiro for instance- brings in at least 6,000 tons of food per day. New York with 16 million inhabitants imports 20,000 tons. Roughly half of this food is

transformed into human energy, the other half is shunted to sewers or trucked to increasingly remote landfills.

The difference of the environmental impact of a developed and developing country is significant: a city of 650.000 inhabitants in North America would require 30,000 square kilometres to maintain its present consumption levels while a similar sized city in India would only need 2,800 square kilometres. On average, slum dwellers in New Delhi, India, require only 0.8 hectares (2 acres) of land per capita to maintain their minimal lifestyles, while Americans in Boston or New York need 8.4 hectares (21 acres) of land per capita to support their consumption levels.

The calculation of environmental impacts of cities should not obscure the fact that certain enterprises and higher income groups contribute disproportionally to these footprints. The environmental impact of a low-income households is much less than that of a wealthier one and although cities use a lot of resources they also serve a greater number of people on a relatively small area of land. The impact analyses provides a good overview of interaction between urban and rural areas, but is only of limited use for developing responses and policies.

In contrast the ecosystems approach is a strategy for integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. The ecosystems approach, which takes the ecosystem as a starting point, does not distinguish between urban and rural problems as such, but analyzes the use of ecosystems for the services it provides, both in the urban and rural areas. An ecosystems approach has the following key characteristics:

- Ecosystems offer services in three areas: provisioning (e.g., water and wood), regulating (e.g., cleaning of water and air), and cultural services (e.g., aesthetic values/ recreation).
- These services are not exclusive to each other but are complementary to and inter dependent on each other; deterioration in one service will cause deterioration in another service.
- The degree of interdependency among the services is characterized by long lag times; in other words, it may take many years before deterioration in the regulating services caused by an overuse of the provisioning service will be experienced and its impacts on the other services may take even longer.

All ecosystem services contribute directly or indirectly to human well-being.

• Deterioration in ecosystem services can cause some groups of individuals to fall into poverty or prohibit those already in poverty from getting ahead.

Often ecosystems provide products to both cities and rural areas, and also impact on cities and rural areas. A good example is the Aberdares Mountain Range in Kenya, just north of Nairobi. One of the major threats of the Aberdares forest is the cutting of trees for production of charcoal. Most of the charcoal is transported to the urban and peri-urban centres of Nairobi to be used for cooking. At the same time, due to the disappearing forest, the provision of water to Nairobi is being threatened.

Urban Expansion

Urbanization world-wide has resulted in cities rapidly growing and expanding to be able to host their increasing populations. This expansion, often referred to as urban sprawl, has been significant and which also result in GHG emissions, such as cutting of forests for wood supply, burning of wood for charcoal production, and food production for the cities.

According to the IPCC (the Intergovernmental Panel on Climate Change), the sea level is expected to rise worldwide from 8 to 88 centimeters during the 21st century, mainly due to thermal expansion of water and the melting of glaciers and ice caps. Many cities are located on, or close to, the shore and are therefore directly subject to the effects of sea-level rise. Especially reclaimed low level lands -- whether reclaimed formally or informally -- are vulnerable. Cities that are likely to be affected can be found on all continents, for example Alexandria in Egypt, Banjul in The Gambia, Tianjin in China, Jakarta in Indonesia, and Bangkok in Thailand. The impact of climate change on cities includes flooding and landslides, sea level rise affecting coastal cities, extreme temperature fluctuations, water shortages, windstorms and other extreme weather events, air pollution, and intensification of urban heat islands.

Cities are vulnerable to violent weather events, which are claimed to be caused or exacerbated by climate change. The poorest city dwellers often live in poor quality housing, not built to withstand such weather events. Informal settlements are often found in disaster prone areas, such as into or close to wetlands, coastal areas, unstable slopes, flood prone swamps and earthquake sensitive areas. The IPCC estimates that between 1 and 70 million coastal residents in Africa may be affected by flooding by 2080, most of them living in cities. Cities and their poor inhabitants are the first to be affected by natural disasters. As the health and sanitation situation is poor, epidemics often break out first in the slum areas after these extreme weather events.

Increasingly researchers find that land use and land use change play a key role in global climate change. The change of non built-up areas into built areas is a key contributor. Urban expansion, including the destruction of forests and plants, has a strong effect, not only on GHG emissions, but also on the change of the local and regional climate. For example, replacing forests with crops means less respiration and thus higher temperatures.

There are many policies that cities can initiate that will combine reduction of GHG gasses with local benefits. A key area to reduce GHG emissions is the building sector. Using different building materials and techniques can reduce GHG emissions (use of alternative materials and more energy efficient houses). Improved local transport policies can reduce congestion and thus local air pollution and GHG emissions. Landfill management and waste management are also important. Recuperating methane gas not only reduces GHG emissions but the gas can also be used for generation of energy. Local governments can promote energy generation from clean resources such as switching power plants from coal to natural gas, promote the use of gas and clean energy sources, co-generating heat and electricity, and promote sustainable energy sources such as solar and wind energy. Win-win situations exist, where implementation of environmental action plans will reduce GHG emissions reducing the global problem of climate change while at the same time these measures have a positive effect on the environmental quality at the city and national level.

Air pollution

Air pollution in cities in developing countries is not only a health hazard for the urban residents, but it also contributes to transboundary air pollution. Air pollutants can travel over long distances, often more than 1000 kilometres, and do not recognize political or geographical boundaries. Air pollution in cities has impacts at the local level (health, urban heat island effect, impact on rural areas around the cities), at the national and regional level (regional air pollution, acid rain, regional climate change), and at the global level (climate change and as a result weather events and sea level rise). Recent studies show the complex interlinkages of the different issues -- air pollution, haze, smog, ozone and global warming - at the different levels.

Acid rain that is affecting the Scandinavian forests is caused by emissions of pollutants from industrial sites in Central Europe. Coal fired energy plants in Canada emit pollutants that contribute to health problems over the border in the US. On the other hand, air pollution from the United States ^{*} contributes to about half of the ground level ozone in southern Ontario and Quebec in Canada.

A good example of air pollutants traveling great distances is the transboundary movement of lead particles in the air, emitted by industries and especially motor vehicles where leaded fuels are still used. Scientists can establish the levels of lead in the air over Greenland over the past centuries by drilling in the Greenland ice cap and analysing the ice core. Recent research shows that lead levels in the air in Greenland went steadily up until the 1970s when unleaded petrol was introduced and environmental regulation was introduced to limit the emissions of heavy metals by industries. This means that air pollutants like airborne lead travel long distances, from mainland Europe all the way to Greenland.

Governments and cities are increasingly cooperating to reduce urban air pollution and its impact. In many cases a sub-regional or regional approach works best to address certain urban air pollution issues. A successful example is the UNEP campaign to phase out leaded petrol in Sub-Saharan Africa. Although lead bas been phased out from petrol in most of the world it is still widely used in developing countries, and especially in Sub-Saharan Africa. The lead in petrol is not consumed by the engine and thus emitted into the air with the exhaust. This has several severe health effects, especially children are affected as very low levels of lead in the air can result in a significant reduction of the growth of their brain and thus their mental development and capacities. The phase-out of leaded petrol has been prioritized at several international meetings and action plans, including the World Summit on Sustainable Development, held in August 2002 in Johannesburg, South Africa. Governments with their partners in the private sector and civil society and with support from UNEP set up the Partnership for Clean Fuels and Vehicles to promote better urban air quality in developing countries through promotion of cleaner fuels and vehicles. As a result, sub-regional action plans were formulated in the five Sub Saharan sub-regions. These sub-regional action plans are now being implemented at the national level. This regional approach to air pollution at the local level has shown to be very successful, and the implementation is still on schedule to phase-out lead from petrol by the agreed date of December 2005.

The Ozone Layer

Cities play a key role in the implementation of the Montreal Protocol and the Vienna Convention -- multilateral environmental agreements signed by national governments to reduce the emissions of substances that destroy the ozone layer. Certain gases, especially those used in refrigerators and cooling equipment (CFCs), but also those used in fire extinguishers and other equipment (HFCs), are damaging the ozone layer when released into the air. Cities were not directly involved in the development of international agreements to reduce the destruction of the ozone layer as national governments negotiated and signed the agreements. However, national governments developed action plans to implement their commitments under these agreements and these often included actions to be taken at the local level.

In many countries, local governments were asked to set up infrastructures to start collecting old refrigerators separately from other wastes. For example, in The Netherlands, by national law, city governments have to separately collect refrigerators and equipment that contain CFCs and HFCs, and present these to appointed companies that will remove the CFCs/HFCs from the equipment. The CFC/HFC-gases will then be destroyed separately. At the same time the export of equipment containing CFCs/HFCs controlled to avoid that the equipment will end up in countries where no similar facilities are in place for tapping the CFCs/HFCs. Gradually, CFCs and HFCs are being phased out globally and replaced by less harmful substances.

Water and Coastal Areas

Cities have great impact on water bodies, rivers, lakes and coastal areas, most of which are shared between different cities, countries or even regions. Approximately 60% of the world's population lives within 100km of the coast, an area that accounts for only about 25% of the land mass. By 2025, over 80% of the largest 30 cities in the world will be in developing countries, and the majority will be coastal mega-cities.

Growing urban populations along coastlines are discharging their wastes into seas, this includes sewage, animal waste, fertilizer run off, and flood water run off. These waste water streams contain nitrogen and phosphate which contribute to eutrophication, where algae and other plants flourish on the nutrients and by doing so deplete all the oxygen from the water, suffocating other plants and animals. However, but it is also a risk to human health, through direct contact or contamination of drinking water resources. This is a major problem in both fresh and saltwater bodies. In some coastal areas "dead-zones" can be found – areas with too little oxygen in the water to sustain the original flora and fauna.

Many coastal cities discharge their sewage, industrial effluent and other wastes into rivers and oceans. For example, in South Africa alone, there are some 63 ocean out-falls along the coast discharging approximately 800.000 m3 of sewage and industrial effluent into the sea every day.

Although sewage systems in cities, especially in developed countries, have been successful in preventing the transmission of sewage-related diseases, in some cases the sewage is not treated sufficiently, causing severe damage to ecosystems and water resources. This impacts not only the environment and the availability of water resources for humans, but it is also the cause of transmission of infectious diseases to bathers and consumers of raw and undercooked shell fish – with a global economic impact recently estimated at USD 10 billion per year.

Few countries in developing country cities have adequate sewerage systems, and they often are limited to more economically advantaged areas. Adequate treatment of wastewater is rare. In Asia, for example, treatment plants process only an estimated 35% of all wastewater, and in Latin America and the Caribbean, only about 14%, Worldwide, two-thirds of the sewage from urban areas is pumped untreated into lakes, rivers and coastal waters.

One of the effects of sewage pollution by coastal cities is the destruction of coral reefs. Untreated sewage dumped into the sea brings an overload of nutrients resulting in growth of algae, that suffocate the corals. Construction along shores and rivers, cutting of forests, especially mangrove forests, and erosion causes the run off of fine sediments into the ocean, directly, or through rivers, that is also blocking sunlight and killing the reefs. A case in point is Singapore where the land area has been increased by more than 10% in the past 35 years. Sediments are continually being stirred up by the massive amount of shipping, damaging corals directly by settling on them and also by reducing the amount of light energy corals receive.

Coastal cities also contribute to the global depletion of fish stocks. More than 90 percent of the world's marine harvest comes from coastal waters and much of it is brought ashore in cities where the fish are being sold.

Biodiversity

As mentioned earlier, cities impact on ecosystems that are closely located to the city borders. Some of the ecosystems that cities are impacting on, including wetlands, woodlands, lakes, and swamps, have national, regional or even international importance from a biodiversity point of view.

For example, Lake Nakuru in Kenya, a soda lake in the Rift Valley, is protected under international conventions on wetlands and migratory birds. Lake Nakuru is host to more than one third of the world's population of Flamingos. At times up to two million Flamingos forage in the shallow waters of the lake. The Flamingos migrate within eastern and southern Africa. A park has been created around the lake of 70 square miles which attracts visitors from around the world to view the abundant wildlife. However Nakuru town, the fourth largest city in Kenya, is situated right next to the Lake. A key problem is pollution with heavy metals such as lead, zinc, mercury, copper and arsenic, which have been linked to massive deaths of flamingos on Lake Nakuru. This pollution is attributed to the collapse of urban sewage systems and unregulated industrial effluent discharge. Pesticides are also a threat to the Lake. There is also a risk that the Lake is slowly drying up. Activities in the city use water sources for activities such as urban agriculture. Up to half of Nakuru's urban farmers use irrigation to support agriculture (even though the use of domestic water for irrigation is illegal). With an extremely high growth rate of 10 percent per year (a doubling of population every seven years!), Nakuru's pressure on the Lake and its Flamingos is rapidly increasing.

In conclusion, UNEP argues that cities have increasing impacts on the environments around them. They interact with the rural areas and they contribute to key environmental issues at the national, regional and global levels. For many of these problems cities have become a key player. This is due to the increased urbanization, which will continue for some time, especially in the developing countries. As we recognize that cities are a key contributor to environment issues outside their boundaries it is important this be taken into account and that we involve them when designing policies to address these global issues. If not, and we concentrate solely at a national, regional and global level, we will find ourselves not meeting our goal of sustainable development.