

MEADOW TO MEGACITY: MEETING FUTURE NEEDS IN AN URBAN ENVIRONMENT

Abstract: There has been considerable interest in determining whether urbanisation is enhancing or degrading the earth's environmental capacity when separated from economic growth and population growth. The environmental sustainability of cities in the developing world is contrasted against cities in the developed world. Results show that sustainability is improved by urbanisation when economic and population growth is constant.

Keywords: Urbanisation; environmental sustainability.

Introduction

The twentieth century has seen extraordinary increases in the number of people inhabiting urban areas. In 1900, approximately 160 million people, or 10% of the world's population was urbanised. A century later urban-dwellers constituted 47% of the world population or 2,850 million people (United Nations 2001).

The influential *Limits to growth* (Meadows et al. 1972) demonstrated that a growing population, growing consumption and growing waste production was not sustainable. Furthermore *Limits to growth* argued that no 'technological fix' could ever enable this growth to be sustainable. Herman Daly (1999) argues that economic growth is similarly unsustainable.

Since the release of the Bruntland report (WCED 1990), vigorous debate has ensued about how to achieve sustainable development, development that enables the human population to meet their needs indefinitely.

In biophysical terms humans draw materials and energy from planetary sources and return wastes and heat to the earth. There are limits to the rate at which the human population can draw from planetary sources and limits to the rate at which planetary sinks can absorb the wastes and pollution created by us. Sustainability involves staying within these limits on a local, regional and global scale (Meadows 1996).

The predominant forces causing changing patterns of human distribution and resource use are not examined in detail in this paper. It is enough to know that a combination of social, cultural, political, technological, geographical and historical forces operate within the framework of economics to cause the trends we are seeing today.

These forces express themselves on a household scale by changing patterns of consumption and production of water, food, energy and goods. On a local scale they are expressed by urban density and patterns. On a national level they determine population distribution among cities.

Once established, growth in urban areas acquires a self-perpetuating nature by combining the cumulative location advantage of good road, rail, sea and air links, high capacity communication lines, adequate housing, consumption and education for the labour force and the opportunity that a concentrated population base brings. (Heilig 1999)

It is useful to group cities based on whether they are in an economically developed nation or a developing nation. The pattern of environmental impact in cities at the early stages of

economic development is quite distinct from the environmental impacts of cities that are in well-developed countries.

Urban trends in developing countries

Leaving the crowded meadow

While it is tempting to believe that a world population evenly distributed in rural villages would be more environmentally sustainable in developing countries than an urban population, the evidence shows that for most countries, the population density of rural areas is even now too high for this to be a sustainable solution.

In many developing countries the rural economy is suffering from chronic underemployment. Rapid population increases have resulted in higher density rural areas and land is, at least temporarily, more productive due to technological advances of the Green revolution. A widening income gap between rural and urban income sectors has made city living financially attractive. Political decisions often reinforce rural regions as a second-class by spending disproportionately more national expenditure biased towards city living (WCED 1990).

It was estimated in 1994 that China has a surplus of around 200 million agricultural workers. Additionally the burgeoning urban industry and service sectors have resulted in high urban labour demand (Heilig 1999).

The hazardous megacity

Many cities facing unprecedented urban growth without accompanying economic growth have not been able to provide basic facilities to meet human needs quickly enough. Groundwater supplies are unable to meet demand and water must be sourced from further and further away, lack of emissions standards or lack of ability to enforce standards results in air pollution, solid and hazardous waste output is not disposed of safely resulting in toxins leaching into groundwater supplies.

China reported 3 million deaths from air pollution between 1994 and 1996. In Shanghai over 65 percent of children have toxic levels of lead in their bloodstream. Toxins from industry and landfills often leach into city's groundwater supplies. (O'Meara 1999)

Cities that are not able to meet demand for resources often find themselves trapped in cycles of degradation that impair the functioning of existing supply. In Jakarta sewage contamination and saltwater intrusion have rendered many wells useless (Brown 1987).

Many cities are often trying to emulate western standards without supporting financial resources and with larger populations. Governments embark on ambitious energy, road and water supply projects rather than providing better public transport, reducing energy demands and making existing water supply more efficient.

Mixing meadows and megacities

It is vital for developing countries to slow the rate of urbanisation so that services can develop alongside increasing urban populations. China is unique among the more developed third-world economies in that the trend of urbanisation has been significantly slowed by government policy. Though China's population has grown from just under 500 million (Heilig 1999) to 1,285 million (United Nations 2001) over the course of the twentieth century its urban population has increased from less than 12 percent to just 30 percent (China Statistical Yearbook, Beijing, 1998 (p.105) cited in Heilig 1999).

For developing cities it may prove easier than developed cities to turn waste into resources and close water circuits. Developing countries have fewer cultural taboos regarding sanitation of water and human waste recycling and can take advantage of cheap workforce for labour intensive recycling initiatives.

Urban agriculture is a practise that has enormous potential in developing countries. Shanghai has increased its food self-sufficiency by extending the city area to over 6,000 square kilometres. These urban outskirts have been converted into mixed-use urban agriculture blocks. The landscape alternates between blocks of two and three story detached and semi-detached houses surrounded by small crop fields. Treated human-waste and water from the city help to increase productivity of this land. These 'urban villages' produce nearly all of the fresh vegetables and most of the grain needs for the metropolis, a remarkable achievement for a city of 15 million people (O'Meara 1999).

Urban trends in developed countries

"The major cause of continued deterioration of the global environment is the unsustainable pattern of consumption and production, particularly in the industrialized countries" - Keating 1993, p6

Clean feet but too big for their boots

Most developed nations have become considerably cleaner in the past two decades as pressure from consumer and environmental groups and government legislation has forced industry to reduce pollution, hazardous waste and become 'cleaner' and 'greener'. However, while this trend is a step in the right direction towards achieving environmental sustainability there has been almost no reduction in the ecological footprint of our cities.

A city's ecological footprint reflects the area of land that is required to provide renewable equivalents for all resource use and waste sinks. For example the use of fossil fuels to produce electricity is equivalent to an area of forest to sink emitted CO₂ and an area of land covered with solar panels or wind turbines to supply energy.

London and Shanghai have approximately the same population and physical area but the footprint required to sustain London is considerably larger than Shanghai's. London requires roughly 58 times its own land area just to supply its residents with food and timber. To supply every person on the planet with a similar level of resources would require three times the available land area (O'Meara 1999).

The pseudo-meadow lifestyle

In many developed countries the growth in the urban population has slowed as urbanites have reached a steady state of between 70 percent and 80 percent and suburbanisation has replaced it. Technological forces such as transport improvements and social and cultural desire for a detached house and garden have changed and are continuing to change the urban form.

The implications for environmental sustainability are an increase in consumption of primary resources for transport and construction and a reduction in agricultural or forestland. Additionally many of the efficiency benefits of the compact city are lost by a trend towards suburbanisation.

The compact city

A high density, or activity intensity provides many opportunities to minimise resource use and hence environmental impact. Energy use may be much more efficient in smaller, semi-

attached dwellings because of lower volumes of space to heat, less surface area to lose heat through and the installation of co-generation district heating systems (Lowe 1991).

Many European cities are compact in area with attached housing several stories high reflecting both the lack of convenient medium-distance travel the maximum density allowed by architectural technology at the time of construction.

Hong Kong has a density of 6,700 people per sq kilometre (United Nations 2000) reflecting its geographically restricted area, construction technology capable of high-rise apartment buildings and cultural acceptance of a high-density lifestyle.

In Oregon a 1973 law requires cities to place growth boundaries around cities to allow further growth without encroaching on agricultural or forestland. Combined with zoning plans promoting "urban infilling" and improved public transport the city of Portland, Oregon has successfully managed to reduce urban sprawl that is so dominate in other cities (O'Meara 1999).

Though the compact city has its detractors (Beheny 1992) considerable evidence relates the compactness of a city to reduced fossil fuel use and improved public transport (Newman and Kenworthy 1999).

Conclusion

"Many efforts to guard and maintain human progress, to meet human needs, and to realize humans ambitions are simply unsustainable.. They may show profits on the balance sheets of our generation, but our children will inherit the losses." - WCED, p8

The paradox of the sustainable megacity

It is a simple matter to enumerate characteristics that make a city unsustainable. A continually increasing population is unsustainable because it is not possible to perpetually increase harvests from finite resources. An open flow of resource consumption to waste is unsustainable because it is not possible to perpetually decrease finite resources (Meadows et al. 1972).

The paradox of the sustainable megacity is that those cities that have achieved a stable population structure are harvesting resources beyond the capacity of the planet to renew them. Those cities that are consuming below their natural limits are either unable to control their population because of poverty or are on an economic trajectory towards higher, perhaps unsustainable resource consumption.

Learning to live within limits

Cities in the future will have to make the most efficient use of their resources possible within the ecological footprint imposed by the natural physical limits of the planet. While it is clear from the evidence that a primarily urban population is both inevitable and a desirable trend for a planet near its ecological limit, it is also clear that, alone, it is far from enough to achieve environmental sustainability.

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